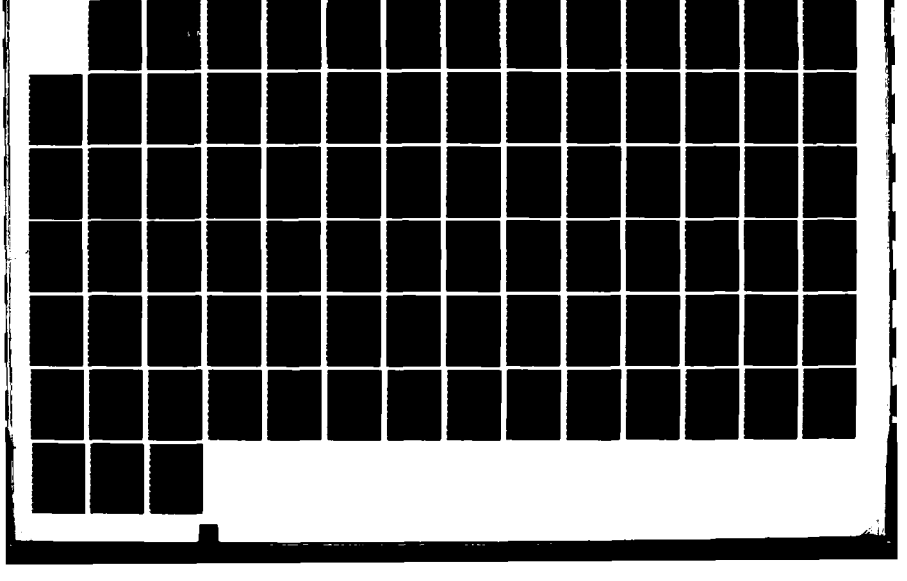
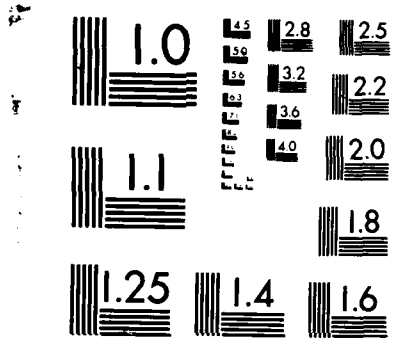
AD-A174 132 AN APPRECIATION FOR MOVING THE HEAVY CORPS -- THE FIRST 1/1
STEP IN LEARNING T (U) ARMY COMMAND AND GENERAL STAFF
COLL FORT LEAVENWORTH KS SCHOO P S KINDSVATTER
UNCLASSIFIED 16 MAY 86 F/G 15/7 NL





(2)

An Appreciation for Moving the Heavy Corps

--The First Step in Learning the Art of Operational Maneuver

by
Major Peter S. Kindsvatter
Armor

School of Advanced Military Studies
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas

16 May 1986

86-3612

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

AD-A174132

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188
Exp Date Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Advanced Military Studies, USAC&GSC 6b. OFFICE SYMBOL (If applicable) ATZL-SWV	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Fort Leavenworth, Kansas 66027 -6900	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification) An Appreciation for Moving the Heavy Corps--The First Step in Learning the Art of Operational Maneuver (U)

12. PERSONAL AUTHOR(S)
MAJ Peter S. Kindsvatter, USA

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Monograph	FROM _____ TO _____	86/5/16	76

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
operational maneuver; Battle of the Bulge; heavy corps; Soviet combined arms army; road marching; movement doctrine

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This monograph discusses the importance of understanding time and distance factors when planning the operational movement of large units over great distances. Such road movements are complex and require a great deal of time to complete, and the commander and staff must be well versed in conducting them. This monograph examines those time and distance factors and shows how important they are in driving operational planning.

The monograph first examines a historical example of such an operational move, specifically the northward shift of elements of Patton's Third U.S. Army in December 1944 to counter the German Ardennes Offensive. Next, the hypothetical movement of a modern Army-of-Excellence heavy corps is portrayed. Then the movement of a modern Soviet combined arms army is depicted and its formations are compared to their U.S. counterparts. In all cases complete roadmarch data is computed, and specific orders of battle and march data are included in the appendixes to the monograph. (continued on other side of form)

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL MAJ Peter S. Kindsvatter	22b. TELEPHONE (Include Area Code) (913) 684-2138
	22c. OFFICE SYMBOL ATZL-SWV

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

Block 19 Continued:

Finally, various considerations and concerns when planning or executing operational movement are discussed, including the use of appropriate map scales, the availability of sufficient good-quality roads, the complications of moving through other formations, the difficulties in moving at night, the time needed to close in and resupply, the importance of security and deception, the possibility of "fast marching," and the inadequacies of current march-planning and execution doctrine.

An Appreciation for Moving the Heavy Corps

--The First Step in Learning the Art of Operational Maneuver

by
Major Peter S. Kindsvatter
Armor

School of Advanced Military Studies
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas

16 May 1986

86-3612

School of Advanced Military Studies

Monograph Approval

Name of Student: Major Peter S. Kindsvatter

Title of Monograph: An Appreciation for Moving the Heavy Corps --The First Step in Learning the Art of Operational Maneuver

Approved by:

Thomas G. Fergusson — Seminar Leader
(LTC Thomas G. Fergusson, Ph.D.)

Richard Hart Sinnreich — Director, School of Advanced Military Studies
(COL Richard Hart Sinnreich, MA)

Philip J. Brookes — Director, Graduate Degree Programs
(Philip J. Brookes, Ph.D.)

Accepted this 14th day of May 1986.

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

AN APPRECIATION FOR MOVING THE HEAVY CORPS--THE FIRST STEP IN LEARNING THE ART OF OPERATIONAL MANEUVER by MAJ Peter S. Kindsvatter, USA, 76 pages.

This monograph discusses the importance of understanding time and distance factors when planning the operational movement of large units over great distances. Such road movements are complex and require a great deal of time to complete, and the commander and staff must be well versed in conducting them. This monograph examines those time and distance factors and shows how important they are in driving operational planning.

The monograph first examines a historical example of such an operational move, specifically the northward shift of elements of Patton's Third U.S. Army in December 1944 to counter the German Ardennes Offensive. Next, the hypothetical movement of a modern Army-of-Excellence heavy corps is portrayed. Then the movement of a modern Soviet combined arms army is depicted and its formations are compared to their U.S. counterparts. In all cases complete roadmarch data is computed, and specific orders of battle and march data are included in the appendixes to the monograph.

Finally, various considerations and concerns when planning or executing operational movement are discussed, including the use of appropriate map scales, the availability of sufficient good-quality roads, the complications of moving through other formations, the difficulties in moving at night, the time needed to close in and resupply, the importance of security and deception, the possibility of "fast marching," and the inadequacies of current march-planning and execution doctrine.

Table of Contents

I. Introduction

The 1982 edition of U.S. Army Field Manual 100-5, Operations, has been justly praised for introducing the operational level of war into Army doctrine. Operational art, falling between military strategy and tactical warfare, translates strategic aims into military objectives to be attained through the successful conduct of campaigns and operations. A critical aspect of operational warfare is the movement of major combat and support elements at the right time and place to influence the outcome of those campaigns and operations. This operational-level movement of forces is defined in FM 100-5 as "operational maneuver":

> Operational maneuver seeks a decisive impact on the conduct of a campaign. It attempts to gain advantage of position before battle and to exploit tactical successes to achieve operational results.... Effective operational maneuver requires the anticipation of friendly and enemy actions well beyond the current battle, the careful coordination of tactical and logistical activities, and the movement of large formations to great depths.[1]

The concept of operational maneuver, while perhaps a new addition to U.S. Army doctrine, is by no means a recent innovation in the conduct of war. Skill at operational maneuver was one of the primary reasons for Napoleon's repeated successes. As British historian David Chandler points out, Napoleon was a master at moving large bodies of troops over great distances. He carefully selected the routes his corps would move on, ensuring that the corps could quickly concentrate for battle when necessary. Each day's march or maneuver was "designed with one single ultimate end in view--the procurement of a favorable battle situation at the earliest possible moment."[2] This careful attention to the movement of his corps frequently allowed Napoleon to out-maneuver his opponents before the battle was even joined. Napoleon, with his sharp mind for calculations,

personally planned these daily marches, assisted by his topographical officer, Bacler d'Albe:

> Bacler d'Albe undoubtedly helped the Emperor in his planning to a very real degree. Together they would crawl over the surface of the map, pressing in more pins, and cursing or grunting when their heads or hindquarters came into collision. Bacler would also be entrusted with important calculations of time and distance. He led a dog's life; the Emperor's first and last command on every day spent on campaign was invariably "send for d'Albe."[3]

Napoleon, though commander of a huge army and leader of his country, nevertheless considered the daily movements of his subordinate formations so important that he saw to them personally. Napoleon was thus thoroughly familiar with the time and distance factors involved in planning the movement of large bodies of troops. This skill, not easily acquired, is vital to the successful execution of operational maneuver. Unfortunately, as one of the principal authors of the 1982 and 1986 editions of FM 100-5 has observed, this skill has largely fallen by the wayside in today's U.S. Army:

> Merely moving a large force, say a heavy corps, on a developed road network with good supporting air facilities and adequate supplies requires advanced staff skills.... Pulling all that together so that every unit's potential can be used and all supporting air and naval forces can be brought to bear in spite of enemy interference is staff work of the highest order. Yet that does not seem to be what our schools teach and it is certainly not what we practice in our exercises.[4]

Herein lies the problem--the 1982 FM 100-5 established operational maneuver as an integral part of doctrine, but establishing doctrine and being able to use it are two different matters. As LTC L. D. Holder pointed out in the above quotation, U.S. Army commanders and staffs are ill prepared to practice operational-maneuver doctrine because they neither learned how to do it while attending Army schools nor practice moving large units over great distances during exercises. For numerous reasons, including

limited force sizes, maneuver-damage problems, safety considerations, and fund constraints, the U.S. Army does not move large forces, such as a complete heavy corps, in peacetime exercises. On the other hand, Army schools can, and in recent years have begun to, teach operational maneuver. The School of Advanced Military Studies (SAMS) is now concentrating on teaching operational-level warfare. In addition, Army Command and General Staff College (CGSC) students now regularly plan operations involving one or more heavy corps, and while these operations remain primarily in the realm of tactical maneuver, they are significantly larger in size and scope than those planned in earlier years.

In adding the study of operational-level warfare to the curriculum, however, a crucial interim step in the learning process has been skipped. A few years ago, the CGSC student planned operations involving brigades, and when he drew a blue arrow on a map representing the movement of a brigade, he felt comfortable in so doing because, in all probability, he had personal knowledge of what was inside that arrow. Today the CGSC student is planning the employment of a corps, yet typically his level of expertise remains that of the brigade. The student consequently draws large, long, "corps-sized" arrows on the map with a bold confidence instilled by ignorance--and the instructor does not usually ask the student if he comprehends the number of vehicles or the length of the columns represented by that arrow. It is this learning of the time and distance factors involved in operational maneuver that has been neglected in introducing operational-level warfare into the Army's schools. The student must first learn, as did Napoleon, how to plan for the marching of large forces over great distances. Only then will he have an adequate appreciation of the time and distance

factors involved in operational maneuver. The intent of this paper is to examine some of those time and distance factors and to show how important those factors are in driving operational planning.

The northward shift of elements of Patton's Third U.S. Army, particularly the III Corps, during the German Ardennes Offensive in December 1944 will be examined as an example of successful operational maneuver. Next, a similar movement by a modern, U.S. Army-of-Excellence (AOE) heavy corps will be portrayed both to provide a size comparison to a World War II corps and to provide an appreciation for the time and distance factors involved in executing such a move. Also, because it is important to understand the time and space factors involved in the movement of Soviet forces, movement of a notional Soviet combined arms army roughly equivalent in size to a U.S. AOE corps will be examined. Finally, some operational considerations in conducting large-unit moves will be presented and the adequacy of current U.S. movement planning and control procedures will be questioned.

Specific movement data for various U.S. World-War II formations, current U.S. Army-of-Excellence formations, and modern Soviet formations will be presented in the following sections. These formations will be considered at full table-of-organization strengths for march planning purposes, containing the numbers of tracked and wheeled vehicles shown in Appendices A, B, and C. The march times, column lengths, and pass times discussed in this paper are based on actual march calculations contained in Appendices E, F, and G. Daytime march calculations are based on a 20-miles-in-the-hour rate of march and a 50-meter vehicle interval. On occasion, daytime march data using a 100-meter interval will be discussed, but if a 100-meter interval is not specifically mentioned, assume that a 50-meter

interval was used. Nighttime march calculations are based on a 10-miles-in-the-hour rate of march, a 25-meter interval, and an assumption that blackout conditions are in effect. The notes accompanying Appendices E, F, and G further explain these calculations. Certain march terminology, such as "pass time," "closure time," "road space," etc., is defined in Appendix H, Glossary of Terms.

II. III Corps in the Battle of the Bulge, 18-22 December 1944.

General George Patton and his Third Army are probably the most often-cited American examples from World War II of a commander and an army adept at operational maneuver. The Third Army conducted numerous bold, rapid movements, one of the most famous of which was the rapid shifting of forces from an eastward orientation to a northward orientation during the December 1944 German Ardennes Offensive. In three days, Patton moved three divisions, a corps headquarters, and a large number of supporting army-level assets (artillery, air defense, engineers, and combat service support) over 100 miles and initiated a counterattack on the morning of 22 December against the southern flank of the German "bulge" that would eventually result in the relief of U.S. forces encircled at Bastogne. This operation warrants closer study as an example of successful operational maneuver.

In the pre-dawn hours on 16 December 1944, Hitler unleashed a major counteroffensive against the thinly held line of the U.S. First Army in the rugged Ardennes sector of the western front. Two panzer armies and an infantry army, carefully built up from the last of Germany's reserves, were to break through the Ardennes and drive to the Belgian port of Antwerp, and in so doing encircle the British

21st Army Group north of the Ardennes. Hitler hoped that this would cause a disintegration of the western alliance and allow a separate peace with the British and Americans.

The 16 December offensive achieved total surprise, and the U.S. commanders were not at first aware of the magnitude of the German offensive. Late in the evening of 16 December, General Omar Bradley, commanding 12th Army Group (which at that time controlled both Patton's Third Army south of the Ardennes and General Hodge's First Army, the force defending against the German offensive), ordered Patton to release the 10th Armored Division to Hodge's VIII Corps. Patton did so reluctantly, and the 10th Armored moved north on 17 December.[5] No other forces were shifted from Third Army on 17 December, and Patton continued to plan and prepare for a Third Army attack by XII Corps against the German Westwall fortifications on 19 December (see Map A for the situation on 17 December).[6]

Patton did take some key precautions on 17 December, however. He called in his III Corps commander, General Millikin, and told him to plan for a possible attack to the north if the German offensive continued.[7] At this early date Patton apparently ordered his Army staff to begin planning as well. The provost marshal indicates in the Third Army Afteraction Report that the routes to be used for any possible move north were established as early as 17 December and that the Army's two military police battalions (the 503d and the 512th) were informed on that date by special courier of the routes and the traffic control responsibilities. (These four routes--A through D--are shown on Map B.)[8]

By the morning of 18 December, General Bradley became aware of the gravity of the situation and summoned Patton to Army Group headquarters. Bradley asked Patton what he could do to help stem the

German offensive. Patton said he could shift three divisions (4th Armored, 26th Infantry, and 80th Infantry) and III Corps headquarters northward if necessary. Patton then called his chief of staff, BG Hobart Gay, and told him to cancel the XII Corps attack planned for 19 December and to have the 4th Armored and 80th Infantry prepare to move north.[9]

Staff planning at Army headquarters shifted into high gear on 18 December. Although no orders had yet been issued by Bradley or by his superior, General Eisenhower (Commander, Supreme Headquarters Allied Expeditionary Forces), Third Army began planning for a northward boundary shift and for a corps-sized counterattack. The G3 section began preparing three possible counterattack options for III Corps.[10] The G4 section called a hasty conference and made plans to shift logistics support northward to support the counterattack as well as to provide support for First Army's embattled VIII Corps, which was expected to come under Third Army control as a result of the boundary change. The G4 issued a special administrative order on 19 December outlining how this support would occur. VIII Corps was also informed.[11]

At 2000 hours on 18 December Bradley called Patton and told him to move his promised support northward at once. Patton was also told to attend a meeting at SHAEF Headquarters in Verdun on the morning of the 19th. Patton in turn ordered the 4th Armored and 80th Infantry Divisions to move to vicinity Arlon and Luxembourg respectively. The 26th Infantry Division was ordered to prepare to move. The Army G3 section worked late into the night to complete the three possible counterattack plans.[12] Third Corps headquarters moved north from Metz to Longwy at 2200 and moved further north to Luxembourg City and then to Arlon on 19 December.[13] The XX Corps assumed responsibility

for III Corps' old sector, being held by the 6th Cavalry Group and the 6th Armored Division. (Sixth Army Group would eventually assume this sector as well as XII Corps' original sector--see Map C.)[14]

Fourth Armored Division began moving north on Routes A and B at midnight, 18-19 December. Combat Command (CC) B, followed by divisional headquarters and CC A, moved on Route B. The division trains moved on Route A.[15] CC R did not move until 20 December after waiting for the 704th TD Bn to join up after being released from the 87th Infantry Division. The three convoys on Route B included approximately 780 wheeled and 685 tracked vehicles (see Appendix A). Moving initially at night under blackout, movement continued into the daylight, with the third convoy (CC A) clearing the start point shortly after 1300 hours. These three convoys occupied 185 kilometers of road space (see calculations at Appendix E). Since the march distance from the start point to the farthest destination (CC B's assembly area) was only 192 kilometers, CC B reached its final assembly area just as CC A was clearing the starting point. Closure time (pass time) for the convoys on Route B was slightly over 7 1/2 hours, which means that at least 7 1/2 hours were required for these convoys to close into their assembly areas after the first vehicle arrived. March time for these convoys from their start point to Longwy (181 kilometers) was approximately 5 1/2 hours at daytime speed and 10 1/2 hours at night speed (with time for breaks). In summary, this column of three convoys of the 4th Armored Division moved over 181 kilometers, in a march that started under night conditions and transitioned into day conditions, with 1,465 vehicles. The transition in the middle of the march from night to day makes estimating the total time for this move difficult, but it would have required at least 18 hours for these convoys to complete this move,

and this assumes "perfect" conditions. CC A, the last of the three convoys on Route B, reports closing at 0230 hours 20 December (26 1/2 hours after the march started), which indicates that the move went rather smoothly, if not perfectly.[16] Altogether the 4th Armored Division moved approximately 2,500 vehicles on Routes A and B on 19 and 20 December.

The 80th Infantry Division moved to an assembly area north of Luxembourg beginning the morning of 19 December. Exact march information on this move is not available, but the division, augmented with additional quartermaster truck companies, would have moved approximately 2,265 vehicles (see Appendix A). Moving on two routes (Routes C and D) in daytime, this move covered 120 kilometers (distance on Route C, which is the longest) and required a march time of about 4 hours (with breaks). Closure time for each of the two columns would have been 6 hours. Hence, a "perfect" move would have required about 10 hours. The 80th Infantry Division closed sometime on 20 December, so, again, the move apparently went fairly well, though not perfectly.[17]

While these two divisions and III Corps headquarters were already on the move, and after the Army staff had drawn up plans for three possible III Corps counterattacks, General Patton arrived at Eisenhower's headquarters on the morning of 19 December. Eisenhower asked Patton how soon he could make a six-division attack. Patton replied that he could make a three-division attack under III Corps control on 22 December, and that to wait any longer to allow the buildup of a larger force would forfeit the element of surprise. Some present felt this was rashness on the part of Patton, but they were not aware that Patton and Bradley had already set this three-division move into motion. Eisenhower approved Patton's plan and it

was decided to conduct an attack from the vicinity of Arlon northward toward Bastogne (which generally coincided with one of Patton's three counterattack options). Following the conference, Patton telephoned his chief of staff and, using predetermined codewords representing the various counterattack options, ordered 4th Armored and 26th Infantry to concentrate north of Arlon and 80th Infantry to concentrate north of Luxembourg City.[18]

On the morning of 20 December, 26th Infantry Division, which had been resting and absorbing 4,000 new replacements in an assembly area near Metz, began moving to an assembly area north of Arlon, closing at 2310 hours.[19] As is the case for the 80th Infantry Division's move, exact march information is not available, but the division would have moved a number of vehicles very similar to the 80th Infantry Division (2,265 vehicles). Moving on two routes (Routes C and D) in daytime, this move covered approximately 85 kilometers and required about 2 3/4 hours. Closure times for each column would have been about 6 hours, for a total movement time of about 9 hours for a "perfect" move. The 2310 hours closing time indicates that the move went smoothly, although not perfectly.

In addition to the three divisions with their attachments (which included three tank destroyer battalions, three antiaircraft battalions, and two tank battalions), numerous army assets assigned to III Corps also moved north from 19-21 December, generally following behind the divisions (see order of battle at Appendix A). Perhaps the most impressive move made by any formation during the northward shift was that of the corps artillery. Artillery units from three different corps (III, XII, and XX), most of which were in position in their respective corps sectors on 18 December supporting various units in contact, moved northward from 19 to 21 December to an

artillery concentration area established northwest of Longwy, vicinity Virton. There they reorganized to provide direct support to the three attacking divisions and general support to III Corps and were in position to support the counterattack which started on schedule at 0600 hours on 22 December.[80] Two artillery battalions and a newly arrived-in-theater observation battalion, a total of approximately 325 vehicles, moved north from III Corps' sector. One artillery group headquarters and five artillery battalions (466 vehicles) moved from the XII Corps sector, and two artillery group headquarters and three artillery battalions (331 vehicles) moved from the XX Corps sector.[81] Thus, a total of 870 wheeled and 252 tracked artillery vehicles, not counting divisional artillery, moved northward (see Appendix A).

Other III Corps units that moved north from 19 to 21 December include the 32d Antiaircraft Artillery Group (60 wheeled and 81 tracked vehicles), Task Force Lion (an augmented engineer battalion with 120 wheeled and 19 tracked vehicles that was tasked to cover the left flank of the corps counterattack by emplacing obstacles and establishing roadblocks), and the sizable 1137th Engineer Group with four battalions (one in direct support to each division and one in general support) and five separate companies (644 vehicles).

Altogether, III Corps moved 7,691 wheeled and 1,713 tracked or half-tracked vehicles northward from early morning on the 19th of December until all units closed on 21 December. Nor was this the sum total of the traffic that moved north on the four designated routes. Portions of the 5th Infantry Division and XII Corps headquarters were also moving north during this period (XII Corps assumed a portion of VIII Corps' old sector to the east of III Corps--see Map C), as were Army-level assets, notably logistics units. The Third Army

Afteraction Report states that 11,800 vehicles (roughly 9,000 of which would have belonged to III Corps) moved north over the four routes during this period.[22]

The shifting of the logistics assets necessary to support the III Corps counterattack and the VIII Corps (which came under Third Army control on 20 December when Third Army's sector officially shifted northward[23]) was possible only through the use of rail movement. The Third Army area was divided into a northern and southern railway district, controlled by the 6811th Traffic Regulatory Group. Third Army unloaded 7,734 railway cars from 16 through 31 December.[24] Movement of troops and supplies during this same period was also supported by 37 quartermaster truck companies (each with fifty 2 1/2-ton trucks with trailers).[25]

It is noteworthy that this large move was initiated rapidly using verbal orders later backed up by brief written orders. The Third Army operational directive for the move north was only one page and was dated 20 December, well after the move was already underway.[26] III Corps headquarters, itself moving north, issued no written orders until the attack order (III Corps Field Order #1, 21 December 1944).[27] The only division to issue a formal march order for the move north appears to have been 4th Armored Division, which issued a one-page order on 19 December.[28] (This order was conspicuous for its brevity--little "routine" march information regarding speeds, intervals, etc. was included, indicating a working familiarity with Third Army's Circular No. 10, dated 4 May 1944, that covered standard operating procedures for roadmarching.[29])

The Third Army conducted a successful operational-level movement from 19 to 21 December. Good initial planning, starting as early as 17 December, and rapid execution, commencing early on 19 December

even before General Eisenhower approved the counterattack plan, enabled all the elements of III Corps to be in position to attack as planned at 0600 hours on 22 December. But in the final analysis, an examination of the routes and time available compared to the number of vehicles to be moved indicates that there was nothing particularly extraordinary about this move. As historian Russell Weigley notes, "The operation should also be kept in appropriate perspective; it was not a unique stroke of genius. Other competent military commanders have accomplished similarly rapid disengagements, turns of direction, and recommitments."[30] In fact, the three divisions initially sent north to compose III Corps were not even in contact, so no disengagement or relief in place was necessary prior to moving north. The move north was not without incident, with a landslide, a weakened bridge, enemy air attacks, and traffic accidents causing detours and slow ups.[31] But, even allowing for such unavoidable "frictions," the road network and time available to move III Corps' 9,000+ vehicles were more than adequate.

While perhaps not a move for the record books, III Corps' shift northward during winter weather into a new and unclear battle situation must certainly be considered a success. It might now be educational to examine how a modern, U.S. Army-of-Excellence heavy corps might fare in executing a similar move.

III. Movement of the U.S. XX Corps

In this fictional scenario, the notional U.S. XX Corps, an Army-of-Excellence heavy corps, is organized with three heavy divisions, an armored cavalry regiment (ACR), and appropriate corps-level supporting troops (see Appendix B). The XX Corps, a REFORGER unit, has drawn its prestocked equipment and has just occupied a sector south

of the Ardennes assigned to it by army group (see Map D). The 208th ACR, the first unit to arrive in sector, is defending the entire corps sector and covering the arrival of the rest of the corps. Twenty days earlier, Warsaw Pact forces launched a surprise winter offensive against NATO that has carried them across West Germany to the edge of the Ardennes region of Luxembourg. The XX Corps' 52d and 53d Mechanized Divisions have closed in their assembly areas. The 23d Armored Division and the corps elements are closing in assembly areas at this time. It is the morning of 18 December. Enemy opposition in front of the corps appears weak, and the army group commander has told the XX Corps commander to plan for an attack eastward in sector on 20 December.

In the pre-dawn hours of 18 December, however, the Warsaw Pact renewed its offensive in an unanticipated sector in the rugged Ardennes area, quickly penetrating an area lightly defended in an economy-of-force role by a light infantry division. The Warsaw Pact forces appear to be driving for the port of Antwerp, which if seized, might cause several of the NATO allies to seek a separate peace and would seriously disrupt the lines of communications emanating from that critical port.

The army group commander has ordered the XX Corps commander to cancel the planned attack for 20 December and instead to move his corps northward to a new sector commencing midnight, 18-19 December. The XX Corps is then to attack into the flank of the rapidly advancing Warsaw Pact forces with all three of its divisions not later than 0600 hours 22 December. The XXI Corps, currently defending to the north of XX Corps against the Pact offensive, will cover the XX Corps' deployment into the new sector. The XX Corps will turn over its present sector to XV Corps defending to the south

of XX Corps, and at that time the 208th ACR will also come under XV Corps control and will continue to defend in its present sector. All other XX Corps elements will shift north on four routes (A through D, see Map D). These routes have been assigned by the army group, and XX Corps will have priority on them starting at midnight. XX Corps' 26th MP Group, assisted by the divisional MP companies, will provide traffic control.

The XX Corps commander issues the following guidance: Move 52d Mech on Routes C and D and 53d Mech on Routes A and B commencing at midnight. Meanwhile, the 23d Armored and the corps elements will finish closing into their present assembly areas and prepare to move north. Once the 52d Mech has cleared Metz on Routes C and D, the 23d Armored will move behind it on Routes C and D. There is not time before the move to task organize the corps elements, which are still closing in, out to the divisions. This will have to be done after the move north. All corps assets except the COSCOM will move north on Routes A and B as soon as the 53d Mech has cleared the start-points. The COSCOM will move north incrementally as quickly as possible after the corps' combat and combat support elements have cleared Routes A and B.

The question in this scenario is, of course: Can this move be done in time for the Corps to be able to attack at 0600 hours on 22 December? Patton's III Corps did so in 1944--can a modern AOE corps duplicate that success? On the surface the forces to be moved appear to be similar in size--each corps has three divisions and appropriate corps-level supporting elements. (The ACR was deliberately left behind in this scenario so as not to unbalance the comparison.) However, a vehicle count by tables of organization and equipment (TO&Es) reveals that the III Corps moved 9,404 vehicles northward,

whereas the XX Corps must move, not counting the ACR, COSCOM, and military police, 22,412 vehicles. The reason for this disparity is simply that the AOE divisions and corps units are much larger than their World War II counterparts, as shown by these examples (data is from Appendixes A and B and includes the augmentation to III Corps' divisions):

	Vehicle Counts	
	World War II	AOE
Armor Division	2,531	5,264
Infantry (Mech) Division	2,275	5,291
Corps Artillery	1,122 (11 bns)	2,296 (12 bns)
Engineer Brigade	803 (5 bns, including TF Lion)	1,707 (6 bns)

The AOE division is twice the size of its World War II counterpart, even when the habitual augmentation to the World War II divisions (tank destroyer, tank, and antiaircraft battalions) is included. Obviously, the AOE division has significantly greater combat power than its World War II counterpart, so the larger size is not necessarily bad--it is simply a fact that must be reckoned with when considering modern operational maneuver and when attempting to apply lessons learned from World War II campaigns to modern operational maneuver.

While the AOE division is larger than its World War II counterpart, it is not faster. The World War II Third Army operations circular governing roadmarch procedures allowed a maximum daytime convoy speed of 25 MPH and a nighttime speed of 15 MPH.[**] An analysis of III Corps' move north during the Ardennes Offensive indicates that the divisions did indeed attain these convoy speeds (when weather and road conditions permitted). The AOE division would be hard pressed to improve upon these speeds. While the M1 and the M2/3 Bradley Fighting Vehicle can attain a significantly higher

roadspeed than 25 MPH, conditions permitting, the remainder of the tracked vehicles that are part of the AOE division, and part of the same battalions as are the M1s and M2/3s, cannot. The M113 series, the M109 series, the M88, and the M578 tracked vehicles are hard pressed in most areas of Europe to maintain a 25 MPH march speed--a 20-miles-in-the-hour (Mih) rate of march is about the best that can be attained.

Given the large size of XX Corps and a rate-of-march of 20 Mih daytime (10 Mih night), the corps will have a difficult time executing this move north, but the march calculations show that it might be feasible. The 52d Mech Division, marching under night conditions from midnight until 0600 hours and then in daylight conditions, will require 7 1/2 hours, with 10-minute halts every two hours, to reach its assembly area and an additional 12 hours to close (pass time for each of the division's two columns in daytime, with a density of 20 vehicles per kilometer, is about 11 1/2 hours). The column on Route C will move slightly over 120 kilometers, and the column on Route D slightly over 98 kilometers. The 52d Mech Division should close in its new location at approximately 1930 hours on 19 December.

The 53d Mech Division, moving on Routes A and B commencing midnight 18-19 December, has slightly farther to go than the 52 Mech (181 kilometers on Route A plus another 30 kilometers beyond the release point to its assembly area). The 53d Mech should reach its assembly area in about 10 hours and require about 12 hours to close (2200 hours, 19 December).

The 52d Mech, when moving north, should clear Metz on Routes C and D at about 1530 hours on 19 December. Allowing one hour's wait time, the 23 Armored Division should then cross its start points on

Routes C and D at 1630 hours. The 23d Armored Division has to travel about 85 kilometers to get to its assembly area. The division will start at daytime rates and go to night rates at 1800 hours, arriving at its assembly area in slightly over 4 hours, with a closure time of about 12 hours. (March data for the AOE mechanized and armored divisions are virtually identical because of their similarity in organization.) Hence, 23d Armored Division closes in its new assembly area at 0830 hours, 20 December.

The 53d Mech Division should clear the start points on Routes A and B at about 1200 hours on 19 December. Given an hour's wait time, the corps-level assets will cross the Route A and B startpoints at 1300 hours. The 61st FA Bde, 63d FA Bde, 51st Engr Bde, Corps HQ (TAC), and 40th Chem Bde will move on Route A. The 62d FA Bde, 64th FA Bde, 10th ADA Bde, 20th MI Gp, and 70th Sig Bde will move on Route B. The columns will move at daytime speeds until 1800 hours and then move at nighttime rates. The corps assets have about 181 kilometers (Route A distance) to cover to get to their assembly area northwest of Longwy. The Route A column, which has the furthest to go of the two, should reach the assembly area in about 7 1/2 hours. The columns will require 14 hours to close. The corps assets should be closed in their new assembly area at about 0930 hours on 20 December.

Thus, on paper at least, the XX Corps could shift northward commencing at midnight on 18-19 December, on four routes, and be closed into its new locations by about 0930 hours 20 December--a total movement time of 33 1/2 hours. Obviously these figures represent a "perfect" march with no complications, no enemy interference, and no friction of war. In reality, this would no more be a perfect march than was the III Corps march in 1944, but the knowledge that

the move is theoretically possible in 33 1/2 hours is a critical start point for the corps staff's analysis of the feasibility of a 0600-hour, 22 December attack. There is no objective way to factor in "friction" to determine how long the march would take in reality. Weather conditions, road conditions, accidents, chokepoints, enemy air interdiction, etc. will all cause friction, just as they did for III Corps. A very general examination of the movements of III Corps' divisions indicates that units required roughly 50 percent more time than that needed for a perfect, on-paper march to actually complete their moves. (And III Corps, relatively speaking, suffered from only a limited amount of friction--the move went rather smoothly, all things considered.) If a 50 percent additional-time factor were added to the XX Corps' move, the corps would require an additional 16 or so hours, meaning that a more realistic appraisal of the corps' closure time, factoring in some friction, might be around 0100 to 0200 hours on 21 December.

The XX Corps is then left from approximately 0200 hours on 21 December until it crosses the line of departure at 0600 hours, 22 December (28 hours) to prepare for the attack. During this period an attack plan must be formulated, intelligence gathered, adequate COSCOM support brought northward, all elements rested and resupplied, and the corps combat-support assets task organized and appropriate elements moved down to the divisions. Finally, the lead attacking elements must move forward to attack positions prior to 0600 hours on 22 December. Can all this be accomplished? Possibly. What this notional move of an AOE corps portrays is the criticality of movement planning and execution to operational maneuver. The time required to execute a "perfect" move--in this case 33 1/2 hours--is a key piece of information that drives the rest of the planning. Once approximate

movement times are known, the commander and staff can then factor in time for friction, resupply, reorganization, etc., to determine the feasibility of the proposed operation. In this case the corps commander may feel he cannot attack at 0600 hours, but at least he can support his case with some valid planning figures when he talks to the army group commander about postponing the attack or about gaining the use of additional roads for the move north if there are any available.

As this notional move by XX Corps illustrates, the movement of AOE divisions and corps is no easy matter. The movement of large operational formations requires warning time, planning time, and time to complete:

> Corps and armies move in formations that allow their rapid commitment to combat. Superficially similar to tactical formations, operational groupings are more complex internally and move more slowly. Support units, supply columns, protective batteries and headquarters accompany large unit movements. Airfields, depots, ports and routes have to be opened and secured behind them. Traffic control, air defense, advance reconnaissance and route improvement all play important roles in a large force's movement.[33]

Given the complexity of a large-unit move and the huge size of even a three-division AOE corps--more than twice that of a World War II corps--one is justified in wondering if perhaps the U.S. Army's formations have not become too large and too cumbersome. Before one comes to a final opinion on this question, however, one should also examine Soviet views toward operational movement, Soviet techniques in planning large-unit moves, and the size of Soviet formations compared to similar U.S. formations.

IV. Soviet Versus U.S. Operational Movement

The Soviet Army, heavily mechanized and offensively oriented, not surprisingly places a great deal of emphasis on rapid operational

movement. The Soviets consider the movement of large bodies of troops as an integral part of operational warfare. Savkin, in his text on Soviet Operational Art and Tactics, points out that World War II experience clearly indicates the important role of troop movement as a part of operations:

> By the ability of troops to move we understand their ability for rapidly shifting both before the beginning of an operation and in the course of the operation. Its importance was difficult to overestimate inasmuch as [in World War II] troop movements began to comprise a large part of combat operations and maneuver began not only to precede an attack, but also to constantly accompany it and literally permeate it, i.e., it became a content of combat operations.[34]

Savkin goes on to point out that in World War II Soviet infantry formations spent 40 percent of their time simply moving, and that the percentage of time spent in movement by mechanized elements was even greater.[35] Brigadier Richard Simpkin similarly notes this Soviet emphasis on movement, pointing out that the Soviets, unlike the Western armies, consider movement of primary importance:

> It may help to elucidate the Soviet approach to deployment if I remark that the Anglo-Saxon moves between fights, the Russian fights between moves.... For Soviet mobile forces, fighting is not an end in itself or, except in the narrowest sense, a means of imposing one's will on the enemy. It is a means to the continuation of purposeful movement.[36]

The Soviet emphasis on battle drills, the meeting engagement, the ability to deploy from column into prebattle and attack formations, and the ability to quickly reform into columns can be traced to this strong belief in the importance of movement. Given the Soviet's belief in the criticality of rapid, large-unit movement, one might expect the Soviets to have developed some special techniques or procedures for enhancing the movement capabilities of their large, mechanized formations. But, as Simpkin notes, a thorough examination of Soviet procedures indicates that theirs are essentially the same as ours: "Give or take a few refinements of dubious practical value,

I have come across nothing which was not to be found in the British Staff College precis of the fifties...or for that matter in Anglo-American practise of the later years of the Second World War."[37]

Soviet march speeds, hourly rates of advance, vehicle intervals, and march control measures (start points, checkpoints, halts, and designated routes) are similar to those used by Western armies. One small difference in technique is the lack of Soviet march units within a march serial. By eliminating march units from within the serial, the Soviets are able to attain slightly higher column densities within their formations than in Western armies, but this also results in larger columns with less flexibility.

Given that Soviet march procedures and capabilities are not radically different from those of the U.S. Army, it remains to be seen if the Soviet formation sizes give them any more agility or flexibility than their U.S. counterparts. The short answer is "yes," but not significantly so. The Soviet tank division has 3,423 vehicles versus 5,264 vehicles in a U.S. AOE armored division. (See Appendix D for a comparison of U.S. and Soviet formations.) The Soviet motorized rifle division (MRD) has 3,561 vehicles and the U.S. AOE mechanized division has 5,291. The U.S. AOE divisions enjoy a slight advantage in tank and armored personnel carrier strength and a significant advantage in helicopters. The Soviet divisions have a fairly significant artillery advantage.

A Soviet tank division moving administratively (i.e., without reconnaissance, advance guards, or flank guards pushed out from the main body) in the daytime will occupy 377 kilometers of road space (189 kilometers at night) and have a pass time, or closure time, of 15 hours and 55 minutes (day or night). An MRD occupies 385 kilometers of road space (192 kilometers at night) and has a pass time of

16 hours and 13 minutes. In comparison, a U.S. AOE division (mechanized or armor) has a daytime road space of 526 kilometers (263 kilometers at night) and a pass time of 22 hours and 35 minutes (day or night). Hence an AOE division occupies from 141 to 149 kilometers more road space than its Soviet counterpart and has about a 5 1/2 hour longer pass time.

It is important to note that the above calculations for daytime movements are based on a 50-meter vehicle interval. If a U.S. AOE division increased the interval to 100 meters (a common daytime march interval in most U.S. units), the road space increases to about 788 kilometers and the pass time to 28 hours and 30 minutes. Nor do these calculations include any augmentation to either the U.S. or the Soviet divisions. When an AOE division, or its Soviet counterpart, gets "loaded up" with assets from higher, the formations become even bulkier. For example, adding a field artillery brigade (with three battalions), one engineer battalion, a mechanized smoke generator company, and a Chaparral air defense battery to an AOE division adds another 877 vehicles and increases the daytime road space by 80 kilometers with a 50-meter vehicle interval or 124 kilometers with a 100-meter interval. Night road space increases by 40 kilometers. Pass times are increased an additional 3 hours 33 minutes (50-meters-interval day march or during a night march) or 4 hours 31 minutes (100-meters-interval day). Soviet divisions similarly augmented suffer a similar bulking up.

The obvious lesson from these figures is that neither the Soviets nor the U.S. should move divisions on one route if they can avoid it. With two routes, depending upon how the subordinate convoys are allocated to move on those routes, division pass times and road space are basically halved. With three routes, of course, the times and road

space are reduced to one-third. Very quickly, however, the problem then becomes the number of available roads. To move an AOE corps or a three-division combined arms army (CAA) in one echelon ideally calls for nine or more good roads going in the same direction. Even using nine roads, pass times for a U.S. column (one-third of an AOE division plus one-ninth of the follow-on corps elements) is going to be about 10 1/2 hours and the column will occupy about 255 kilometers of road space (day, 50-meter interval). Pass time for a Soviet column (one-third of an MRD plus one-ninth of the follow-on CAA assets) is going to be about 7 hours, and the column will occupy about 160 kilometers of road space (day, 50-meter interval).

Comparisons of Soviet and U.S. formations above division level are difficult because both armies tend to task organize their higher formations to support a varying number of subordinate divisions. A notional 8th Combined Arms Army, designed to support three divisions, and without any front-level augmentation (which would not be unusual for an as-yet-uncommitted, second-echelon army), is depicted in Appendix C. Comparing this CAA to the notional US XX Corps (Appendix B) indicates that, while the same basic types of units are to be found in each organization (artillery, air defense, engineer etc.), the U.S. AOE formations tend to be larger. The XX Corps has 8,584 vehicles in its corps-level organizations (7,045 not counting the ACR) while the 8th CAA has only 3,366. The specific numbers are not important, since each AOE corps and CAA will be organized differently, but the point is that the AOE corps, just like the AOE division, tends to be larger than its Soviet counterpart. A CAA significantly augmented by front assets for a major operation, however, could well approach the size of an AOE corps.

In summary, Soviet divisions and combined arms armies tend to be

smaller than their U.S. counterparts, but not radically so. Given that the Soviets use similar march procedures and have march capabilities similar to those of U.S. formations, then it is reasonable to assume that the Soviets will have as much difficulty, if not more given their number of units, in moving their operational formations. The Soviets do appear to have two advantages, however, over Western armies. First is their doctrinal emphasis on rapid movement as an integral, and critical, part of operational art. Second, given their huge force structure, available maneuver space, and funds, the Soviets have periodic opportunities to practice large-unit moves in training--not to mention the experience gained from such operations as the occupations of Czechoslovakia and Afghanistan.

In studying the III Corps' move during the Ardennes Offensive, and in calculating the time and distance factors involved in moving modern U.S. and Soviet formations, one gains insights and surfaces issues concerning the conduct of large-unit movements. An analysis of these insights and issues is presented in the next section.

V. Considerations in Conducting Operational Movement

A variety of considerations and concerns arise when planning and conducting operational movement, to include the use of appropriate map scales, the availability of good-quality roads, the complications of moving through other formations, the difficulties in moving at night, the time needed to close in and resupply, the importance of security and deception, the possibility of "fast marching," and the inadequacies of current march-planning and execution doctrine. Each of these issues will be examined in greater detail.

An operational move generally covers a significant distance. Planning such a move on large-scale maps, such as the commonly used

1:50,000 scale, provides good resolution of the terrain and road network but results in a huge, unwieldy map. As General Patton recommends, large-unit commanders should not operate off such a map:

> In my opinion the use of large-scale maps by senior officers is distinctly detrimental, because by the use of such maps they get themselves enmeshed in terrain conditions.
>
> Putting it in general terms, Army and Corps Commanders are not so much interested in <u>how</u> to beat the enemy from a tactical standpoint as in where to beat him. The where is learned from a careful study of road, railway, and river maps.[38]

As General Patton points out, road and rail nets are of key concern to operational-level commanders. Unfortunately the U.S. Army's next commonly used, modern map scale is 1:250,000, which is too small of a scale to adequately portray the road network so critical to operational planning. A better map scale for operational planning would be 1:100,000, the map scale used by the Third Army during World War II. These maps portray the entire road network in sufficient detail to allow march planning without being too cumbersome. The shift northward of Patton's Third Corps, for example, covered six 1:100,000 scale map sheets, requiring only about six-feet-by-six-feet of wall space to display. Currently some units, notably in United States Army Europe's VII Corps, have acquired 1:100,000-scale maps by enlarging 1:250,000 scale maps. Perhaps it is time for the U.S. Army to formally revive this scale of map.

Not only will there be a problem in finding an adequate number of roads upon which to move large units, but also there will be difficulty in finding roads of sufficient strength to sustain a high volume of heavy military traffic. Failure to consider road strengths or to neglect measures for their repair is to invite trouble, as happened to the Soviets when they invaded Czechoslovakia in 1968:

> The thin asphalt of the Czechoslovak roads soon became hopelessly churned up by the steel treads of Soviet tanks.... It transpired that Soviet Army engineers had no equipment or machinery for repairing roads.[39]

Road damage was not a significant problem during Patton's shift northward during the Ardennes Offensive, but this was in large measure due to the smaller numbers and the lack of heavy tracked and multiaxled trucks in the World War II divisions in comparison to what is found in an AOE heavy division. The northward move of the notional AOE XX Corps as described in Section 3 would probably cause significant road damage. An analysis of these four routes indicates that, on at least a portion of each route, traffic would move on two-lane, Class-C roads. (A Class-C road roughly equates to a red-and-white striped road on a modern 1:50,000 scale map.) Such a road is designed to withstand an average daily traffic flow of 1,600 to 2,500 vehicles, only 30 percent of which can be tracked or multiaxled trucks.[40] In the case of the XX Corps movement, approximately 6,000 vehicles would have passed on each route in a 33 1/2 hour-period, the majority of which would have been tracked or multiaxled trucks. In short, all four routes would have been, at least in certain areas, virtually destroyed. Only autobahns/interstates (Class A roads) and perhaps the more substantial two-lane roads (Class B) can handle the passing of modern, large-unit formations without suffering irreparable damage.

Another consideration in planning large-unit movements is the impact such movements may have on the operations of other formations. During the notional move of XX Corps, it crossed through the adjacent XXI Corps' sector. Merely coordinating for this move is a difficult problem, but it was assumed in this case that the army group had effected the necessary coordination. The larger question is the

impact the move will have on XXI Corps operations. For over 33 hours, four huge columns of vehicles will be cutting across virtually all of the XXI Corps' main supply routes, not to mention the follow-on XX Corps COSCOM assets that must also shift north. Proper march discipline and traffic control should permit XXI Corps east-west infiltration traffic to pass in between serial and convoy gaps in the XX Corps columns, but the amount of such possible traffic would be limited. Furthermore, vehicle straggling (excessive intervals), a common problem in a poorly disciplined march column, can very quickly fill up such gaps. In short, the XXI Corps will be hard pressed to accomplish anything more than routine resupply for about a 36-hour period as XX Corps moves 24,000 vehicles, followed by a COSCOM, through the XXI Corps area. Any major shifting of forces by XXI Corps during that period will be difficult if not impossible.

As the XX Corps moves north, it presents a tempting target to enemy air interdiction. The establishment of air defenses to cover the four routes will be critical--an effort that will require army group coordination and assistance. A commonly proposed solution to the problem of air interdiction is to move at night. A night move also provides a measure of operations security. The night movement of large formations, however, requires a great deal of time. Night moves are time consuming because of the slow rate of march under blackout conditions and because of the significant amount of time required to close large columns into concealed assembly areas before dawn. Assuming 12 hours of darkness, a convoy could conceivably cover about 100 miles, allowing for short halts, but time must be allotted for moving the convoy under cover before dawn. This also presupposes that assembly areas of an adequate size, providing adequate concealment, and at the proper locations along the route of

march, are available. Careful planning and the identification of as many such assembly areas as possible, ideally enough to allow separate march convoys or even serials to simultaneously go to cover all along the route as dawn approaches, is necessary. Aggravating the problem in the case of the XX Corps' move would be the presence of XXI Corps' rear echelons and reserves in many of the same locations that would be needed for XX Corps' convoys to occupy before dawn. Certainly, in most areas of operation, any operational movement conducted only at night will require a time-consuming incremental shifting of forces over multiple nights and multiple routes.

Another major consideration in conducting large-unit moves is the significant amount of time required for the formations to close into their assembly areas upon arrival at a new location, followed by additional time required to resupply and reorganize. In the XX Corps example, the heads of the 52d and 53d Mechanized Division columns reached their assembly areas at about 0730 and 1000 hours, 19 December, respectively. The final elements of the corps did not close into their assembly areas until 0830 hours (23d Armored Division) and 0930 hours (corps-level assets) 20 December, and these times represent a "perfect" march. Thus, for at least a 26-hour period, four huge columns were closing into their areas--a tempting target and one very difficult to conceal from the enemy.

Once the units closed, an undetermined period of time was then required to reorganize and resupply. The resupply effort required the shifting of COSCOM assets northward, as the AOE division's capability to sustain itself without corps support is very limited. The AOE division can move 808,000 gallons of bulk fuel with its organic assets.[41] Assuming a daily fuel requirement of slightly over 500,000 gallons, after the division refuels its vehicles following

the road march, probably less than a day's supply of fuel remains.[42] Nor will the AOE division have a great deal of other classes of supply on hand when it arrives at its new location. After moving its TO&E equipment, personnel (with clothing and equipment), and fuel, the division has about 3,449 short tons of haul capability remaining.[43] An AOE division, in the first day of an attack (which is what XX Corps moved north to do), will expend about 2,050 short tons of ammunition, 81 short tons of class IX repair parts, and 36 short tons of combat rations.[44] With requirements for the other classes of supply added in, notably class IV, the AOE divisions can probably sustain an attack for about one day after arriving at their new location, with fuel being the most critical item. Hence, while it is difficult to estimate how much time XX Corps will need to reestablish its supply dumps and support facilities in the new corps sector, it is clear that such dumps and facilities will have to be in position before the attack, and this will take time.

Thus, during the 26-hour closure time as well as the period of time needed to resupply and reorganize, the XX Corps will be vulnerable as it concentrates in its new area. This highlights the importance of security and deception as a part of any operational move. First of all, the corps must be protected, or covered, by some force during this period of concentration. In the XX Corps example, the XXI Corps was charged with this responsibility. If no other formation is available to do this, the ACR is a prime candidate for this mission, as indeed the 208th ACR was doing for XX Corps as the Corps initially concentrated in the south. Operations security is also critical. Camouflage, night movement, radio listening silence and local security are all important. Finally, some sort of deception plan is needed. The ACR or a portion of a division can move in a

different direction to establish a false assembly area, for example.

One technique used by the Soviets that provides an additional measure of security and often allows for surprise is the use of concentration areas. Depending on the size of the formation to be moved, the Soviets will concentrate a newly arriving formation well to the rear of the front lines (possibly 50 to 70 kilometers). Once the formation is concentrated, resupplied, and ready for commitment, the formation is then moved forward, often at night and over multiple routes, to more-forward assembly areas (25 to 30 kilometers from the line of contact). Units are then moved to final assembly areas (not unlike attack positions) perhaps 5 kilometers from the line of contact just prior to the attack.[45] These last two forward moves are done rather quickly, as near as possible to the time of the attack, thereby enhancing the chances of surprise. While in the initial concentration area, the formation can prepare for the upcoming attack at a location fairly distant from the front lines and therefore harder for the enemy to discover or target. Also, if the concentration area is discovered, the enemy will still be in doubt as to the specific area the formation is to be committed in because the formation is still such a great distance from the front lines. The U.S. Army should also begin thinking in terms of operation-level "concentration areas" and not just tactical-level assembly areas or attack positions.

One factor that becomes apparent when comparing World War II operational moves to modern operational movement planning is that the modern AOE division or corps is no faster than its World War II counterpart. As discussed in Section 3, the M1 tank and M2/3 Bradley Fighting Vehicle, while indeed faster both on and off-road than anything in World War II, are tied to organizations that contain

numerous vehicle types that are not faster than their World War II counterparts. In order to capitalize on the true mobility advantage of the M1/2/3 family, the AOE corps commander might consider conducting a "fast march" by an ad hoc column consisting solely of M1/2/3-type vehicles and possibly a fast, wheeled support package. Road and weather conditions permitting, such a column could certainly maintain a 30 or even 40 miles-in-the-hour rate of march. The ACR might be used for this purpose, with each of the three squadrons providing a task force of 41 M1s, 38 M3 CFVs, and a wheeled support package with fuel and ammunition (being careful not to overload the support vehicles, thereby slowing them down too much). Such a "flying column" could move in advance of the rest of the corps to get ground combat power quickly to a critical spot. A significant risk is obviously being taken, in that such a formation immediately outruns virtually all its combat support (artillery, engineers, air defense, etc.) and will have limited command-and-control assets and combat service support. Army aviation and Air Force support could offset, to some degree, this lack of support. If the situation is critical enough, however, such a force might, for a short period of time, serve a stop-gap function while the rest of the formation arrives. Obviously, such a "fast march," to be effective, would have to be carefully practiced.

Finally, and perhaps most importantly, the movement of larger sized formations requires considerable planning and careful control during execution. The planning must be expeditious, giving all concerned sufficient time to prepare for the march. Also, a complex control-and-support apparatus must be positioned to facilitate the execution of the march. Highway regulating teams to monitor movement, military police elements to control the traffic flow, engineer

road-repair teams, air defense at critical points, route and NBC reconnaissance teams, pre-positioned recovery teams, refuel points, medical stations, security forces, and signal posts may all be needed. Who formulates the plan for all this? Who decides what divisional, corps, and theater army assets will be used to form this march support apparatus? Who controls this apparatus and coordinates its efforts? In this area of large-unit march planning and control U.S. doctrine is inadequate.

The greatest weakness in movement planning and control is fragmented effort. The number of staff agencies that must coordinate with one another in planning and controlling a march is excessive. Indeed, if there is one word that appears more often than any other in movement control doctrine, it is "coordinate." The division G3 must coordinate the division's move with the division transportation officer (DTO), who normally comes under the staff supervision of the G4. The DTO prepares the actual movement schedules--hence, detailed movement planning is more a G4 function than a G3 function at division level and higher. The DTO must coordinate with the movement control officer (MCO) in the DISCOM because the MCO controls the transportation assets and is responsible for the movement of logistics (though not for the movement of troops). The DTO must coordinate with the military police for establishing traffic control points (TCPs). TCPs, however, only direct traffic and enforce rules of the road. The actual regulation, or monitoring, of the march is done through a number of highway regulation point teams (HRPTs), which are provided, if available, by corps.

Of course, if the move is across division boundaries or into the corps rear area, the DTO must coordinate his move with the corps' highway traffic headquarters (HTH), a subordinate agency of the

COSCOM's movement control center (MCC). The HTH will establish the highway regulation point teams (HRPTs) needed to control the troop movement. These HRPTs, however, do not control the movement of logistics. This is done through regional movement control teams (MCTs) which are subordinate not to the HTH but directly to the MCC (similar to the split between the DTO and the MCO at divisional level). As at the division level, the HTH does not directly control the TCPs established by the provost marshal. Also, at both corps and division levels, the HTH and DTO must coordinate with the engineers for road or bridge repair teams.

Finally, if the move is across corps boundaries or into the theater army rear area, then the HTH must coordinate with the theater army highway traffic division (HTD), which is subordinate to the theater army movement control agency (MCA). Without going into painful detail, the MCA has the same sort of coordination requirements with a variety of agencies as do the corps and division.[46]

Obviously, this is a great deal of "coordination," especially for a movement of forces across corps boundaries (as was the case for the XX Corps' move). It is also significant to note that this coordination and planning is basically outside of operations channels, thus requiring further coordination between G3s and G4s to ensure that the movement control staffs develop a movement plan that conforms to what the operations types want. Former-2d SUPCOM commander MG Albin Wheeler, in discussing movement control during a deep attack, aptly describes this coordination dilemma:

> If the highway network is not intensively managed, the deep attack force will come to a standstill before reaching the FLOT.
>
> Although the corps G3 issues orders for unit missions, he does not analyze and establish priorities for the terrain and movements requirements of these units. In like manner the corps movement control center (CMCC) or the division

transportation officer (DTO) alone cannot establish the priority of movement on routes of advance and MSRs crossing corps or division boundaries and eventually projecting across the FLOT. A coordinated effort between the corps staff, CMCC and DTOs is required to ensure the rapid movement of the attack force as well as supporting units.[47]

Current doctrine requires excessive, time-consuming coordination and dangerously divides movement responsibilities for planning and execution between various agencies. A better system might be that adopted by the Germans in World War II. Field Marshal Kesselring describes the German system, in which a traffic control officer (TRACO) was appointed by the commander and worked as an agent of the G3. The TRACO had a clearly established mandate from the commander to plan the march; to establish the necessary communications to control the march; to recon and mark the route; to establish traffic control points; and to establish and control the security forces, road-repair teams, medical stations, recovery teams, and refuel points. The TRACO did not have to "coordinate" with anyone because he was actually in command of what amounted to a "movement task force" of engineers, MPs, air defense, reconnaissance elements, medics, maintenance teams, and signal units. Control was clearly through operations channels from the TRACO to the G3 and then to the commander.[48] The U.S. Army needs to revamp its movement planning and control procedures if it hopes to execute timely, large-unit operational movements.

VI. Conclusion

While the last section discussed some, and by no means all, of the issues and concerns involved in planning and conducting large-unit movements, it is important to keep in focus the first step, which is not to find solutions for the above concerns, but rather to

educate a generation of officers as to the complexities involved in planning and conducting operational movement. Only after gaining an appreciation for the complex time and distance factors involved in such movements will commanders and staff then be able to address the issues discussed above. The army educational system of pre-World War II, as LTC Holder points out, did not neglect this area of study: "Both CGSC and War College students learned to mass and move armies and corps in the 1920s and 1930s as a regular part of the curricula."[49] An examination of the Command and General Staff School (CGSS) schedules bears this out. The following classes were taught to the first- and second-year CGSS students in 1930-31 (CGSS was a two-year course then) and this list does not include the numerous map exercises and terrain walks conducted by CGSS students which undoubtedly also involved some movement planning:

First Year 1930-1931:[50]

Division Transport
Army, Corps and Divisions in the Advance
Army, Corps and Division Supply in an Army Advance
Army, Corps and Division Cavalry in Advance and in an Attack
Movements by Motor Transport
Marches
Movements by Marching
Supply and Evacuation on the March
Halts and Security on the March and at a Halt
Traffic Control
Supply and Traffic Control in the Attack of a Position
Convoys and Protection of Supply Routes
Cavalry Marches

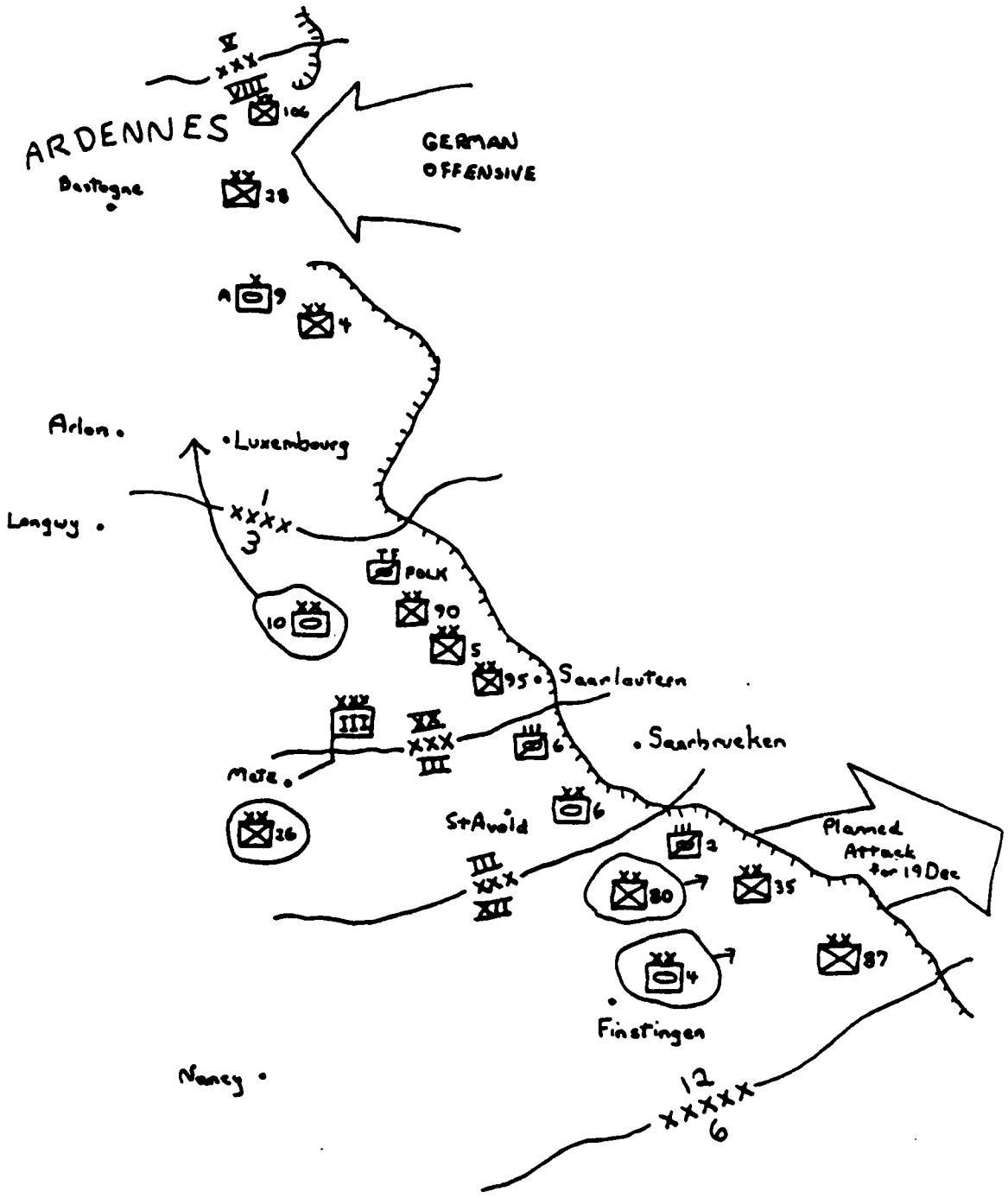
Second Year 1930-1931:[51]

Construction, Repair and Military Utilization of Roads and Highway Bridges
Movement of Corps and Army Artillery
Movement and Tactical Employment of Tanks
Detached Corps--Corps Movements
Detached Corps--Halts
Corps and Army--Army Advance
Corps and Army--Corps Advance
Traffic Control and Maintenance of Lines of Communication
Surprise and Movement

As this list of classes implies, the pre-World War II CGSS student, unlike his modern CGSC counterpart, did not skip the critical, interim step between the tactical and operational level of war --learning the time and distance factors involved in moving large formations over great distances. The CGSS graduates of the 1930s were thus able, during World War II, to draw from their educational backgrounds sufficient expertise in moving large units to be able to make such movements, and the operational successes that are dependent upon such movement, happen. There is no reason why such movement planning could not once again be a part of the CGSC curriculum and be added to the SAMS curriculum. Finally, as LTC Holder points out, there is also no reason why commanders and staffs in the field could not do such movement planning as a normal part of their command post exercises:

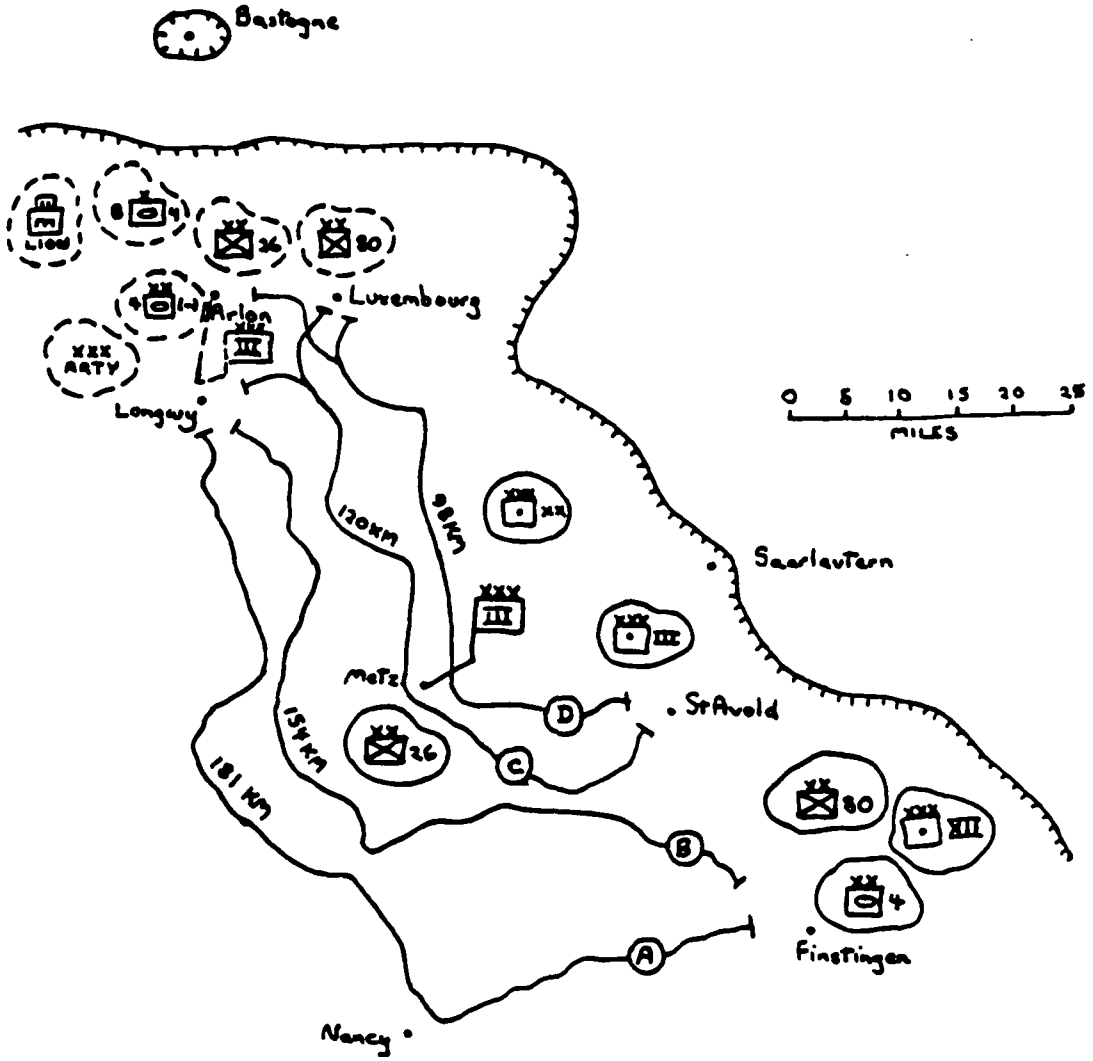
> Continental U.S. corps could run command post exercises over vast areas at small cost and great benefit to their staffs and commanders....Without turning a blade or track, the staff could be put through some drills that have not been done in the Army since 1940. At the same time, brigades might be called on to plan road movement over several hundred miles or for doctrinally standard but rarely exercised flank and advanced guard missions. The support planning alone in such an exercise would be highly worthwhile.[52]

In short, if the U.S. Army is ever to put its new-formed doctrine of operational art into practice, then students and staffs alike must first learn to plan in detail for the operational movement of large forces.



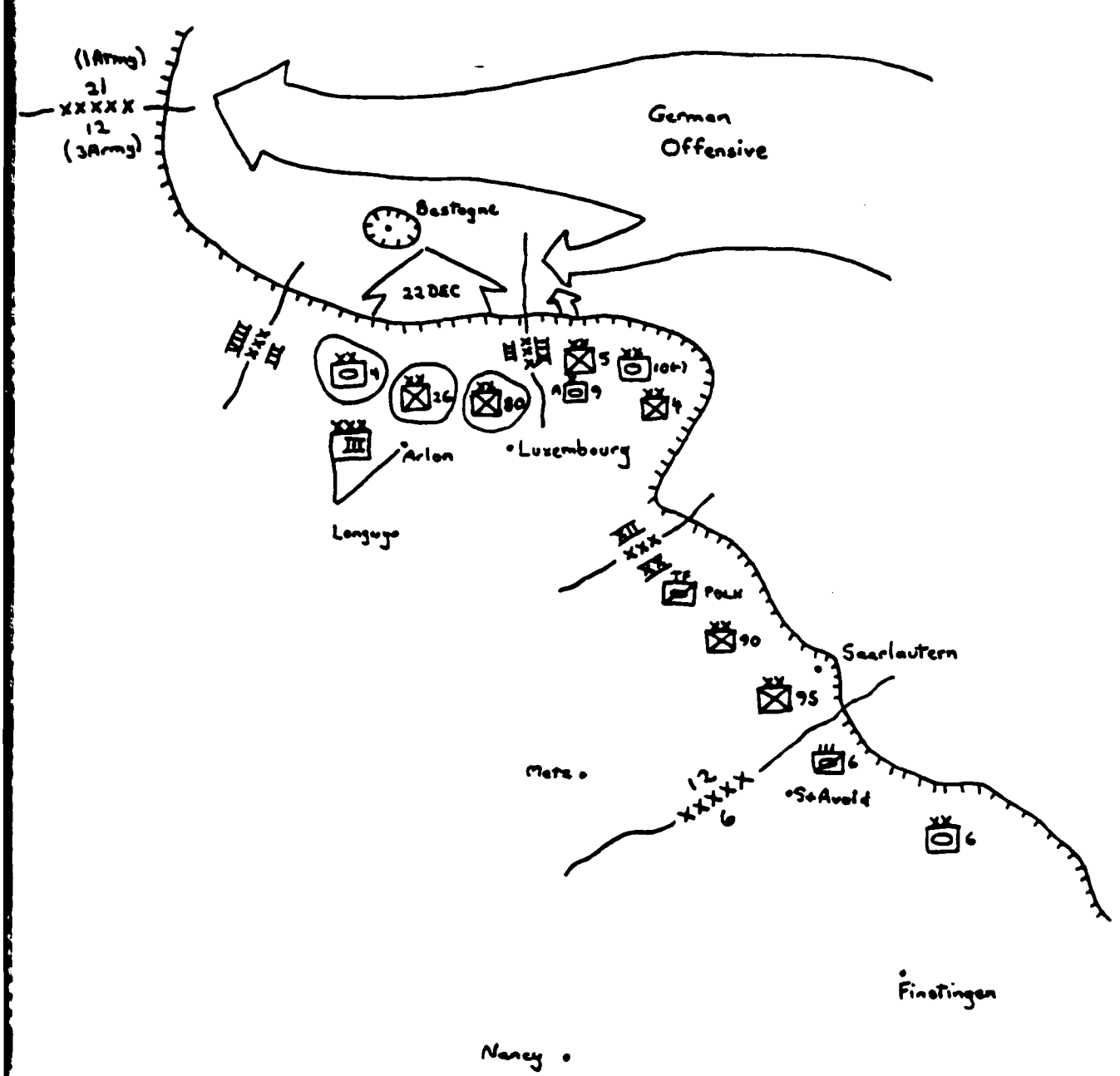
MAP A

Ardennes Offensive--Situation on 17 December 1944



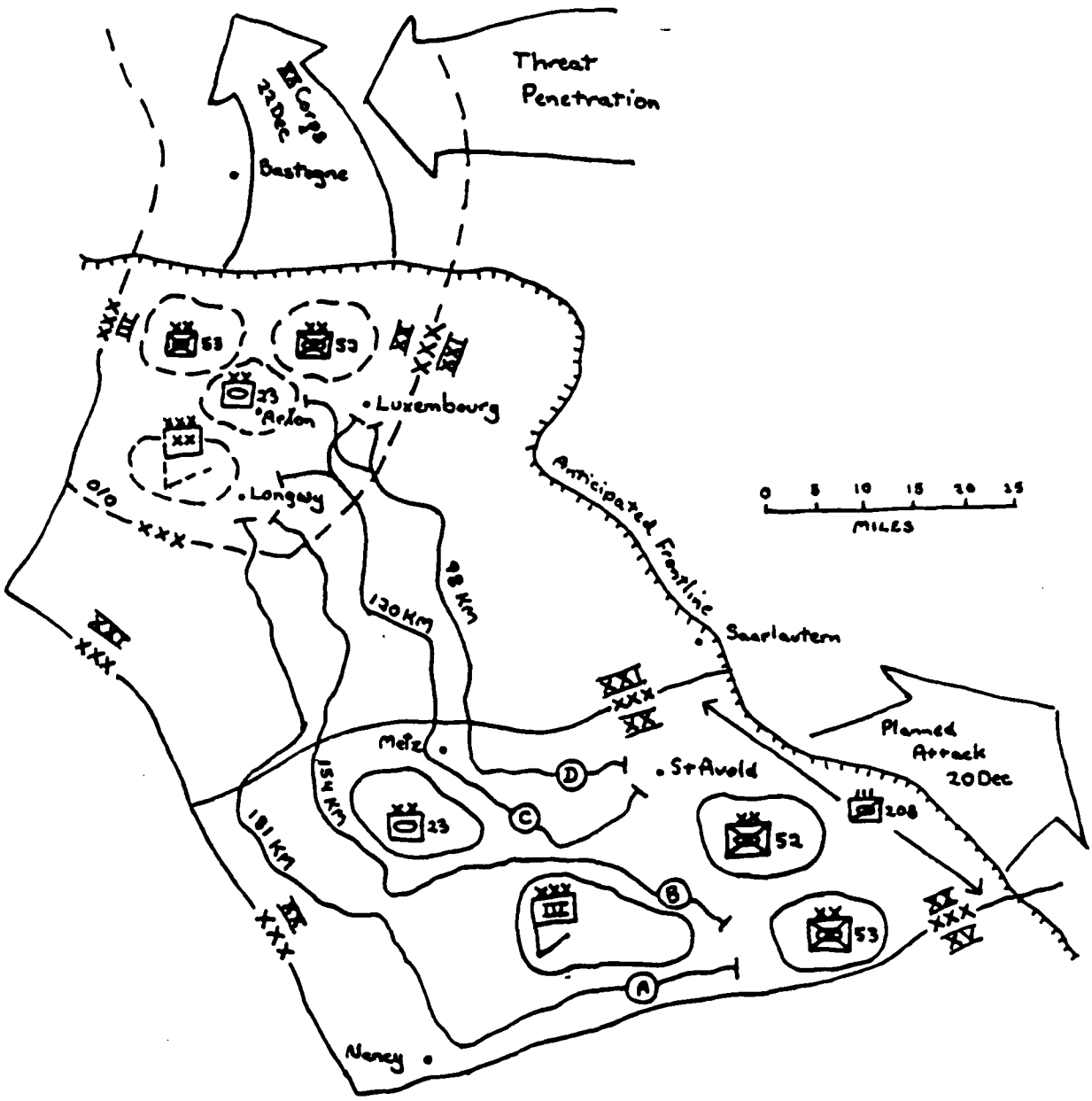
MAP B

Ardennes Offensive--Movements of III US Corps 18-21 December 1944



MAP C

Ardennes Offensive--Situation on 22 December 1944



MAP D

Proposed XX Corps Redeployment

Appendix A: III U.S. Corps Order of Battle (21 December 1944)

1. III Corps HQ (TO&E 100-1) and HC (TO&E 100-2):	W-40	T-0
2. 4th Armored Division (TO&E 17) with attachments, as organized for the roadmarch north.		
Division HQ (TO&E 17-1) and HC (TO&E 17-2):	W-19	T-15
Combat Command A:		
HHC (TO&E 17-20-1):	W-11	T-10
35 Tnk Bn (TO&E 17-25):	W-71	T-98
51 Armd Inf Bn (TO&E 7-25):	W-55	T-79
53 Armd Inf Bn (TO&E 7-25):	W-55	T-79
A/24 Armd Engr Bn (TO&E 5-217):	W-18	T-4
B/489 AAA AW Bn (SP) (TO&E 44-77):	W-6	T-19
A and B/25 Recon Sqdn (TO&E 2-27):	W-72	T-8
HHB DIVARTY (TO&E 6-160-1):	W-22	T-0
66 Armd FA Bn (105-SP) (TO&E 6-165):	W-58	T-53
94 Armd FA Bn (105-SP) (TO&E 6-165):	W-58	T-53
A/46 Med Bn (TO&E 8-77):	W-21	T-1
A/126 Maint Bn (TO&E 9-67):	W-37	T-1
CCA Total:	W-484	T-405
Combat Command B:		
HHC (TO&E 17-20-1):	W-11	T-10
8 Tnk Bn (TO&E 17-25):	W-71	T-98
10 Armd Inf Bn (TO&E 7-25):	W-55	T-79
B/24 Armd Engr Bn (TO&E 5-217):	W-18	T-4
A/489 AAA AW Bn (SP) (TO&E 44-77):	W-6	T-19
22 Armd FA Bn (105-SP) (TO&E 6-165):	W-58	T-53
B/46 Med Bn (TO&E 8-77):	W-21	T-1
B/126 Maint Bn (TO&E 9-67):	W-37	T-1
CCB Total:	W-277	T-265
Combat Command Reserve:		
HHC (TO&E 17-30-1):	W-0	T-0
25 Recon Sqdn (-) (TO&E 11-57):	W-113	T-56
37 Tank Bn (TO&E 17-25):	W-71	T-98
704 TD Bn (SP) (TO&E 18-25):	W-120	T-39
24 Armd Engr Bn (-) (TO&E 5-215):	W-52	T-9
995 Treadway Bdg Co (TO&E 5-627):	W-66	T-1
489 AAA AW Bn (SP) (-) (TO&E 44-75):	W-32	T-24
CCR Total:	W-454	T-227

Division Trains:		
HHC (TO&E 17-60-1):	W-35	T-2
C/489 AAA AW Bn (SP) (TO&E 44-77):	W-6	T-19
144 Signal Co (TO&E 11-57):	W-41	T-19
46 Med Bn (-) (TO&E 8-75):	W-36	T-2
126 Maint Bn (-) (TO&E 9-65):	W-90	T-0
444 QM Trk Co (TO&E 10-57):	W-55	T-0
3804 QM Trk Co (TO&E 10-57):	W-55	T-0
MP Plt (TO&E 19-117):	W-22	T-1
Trains Total:	W-340	T-45

Division Total: W-1,574 T-957 (and 8 aircraft)

3. 26th Infantry Division (TO&E 7) with attachments. Exact march formation for the move northward from Metz is unknown, but the division contained the following units.

Division HQ (TO&E 7-1) and HC (TO&E 7-2):	W-31	T-0
101 Inf Regt (TO&E 7-11):	W-226	T-0
104 Inf Regt (TO&E 7-11):	W-226	T-0
328 Inf Regt (TO&E 7-11):	W-226	T-0
26 Recon Trp (TO&E 2-27):	W-38	T-5
101 Engr Bn (TO&E 5-15):	W-91	T-0
DIVARTY		
HHB (TO&E 6-10-1):	W-23	T-0
101 FA Bn (105-T) (TO&E 6-25):	W-90	T-0
102 FA Bn (105-T) (TO&E 6-25):	W-90	T-0
263 FA Bn (105-T) (TO&E 6-25):	W-90	T-0
180 FA Bn (155-T) (TO&E 6-335):	W-87	T-18
Service Troops		
HQ Svc Trps (TO&E 7-3):	W-3	T-0
39 Signal Co (TO&E 11-7):	W-56	T-0
__ Med Bn (TO&E 8-15):	W-70	T-0
__ Ord Co (TO&E 9-8):	W-29	T-0
__ QM Co (TO&E 10-17):	W-59	T-0
__ MP Plt (TO&E 19-7):	W-27	T-0
Attached Troops		
735 Trk Bn (Separate) (TO&E 17-25):	W-71	T-99
818 TD Bn (SP) (TO&E 18-25):	W-120	T-39
390 AAA AW Bn (SP) (TO&E44-75):	W-50	T-81
QM Truck Cos (equivalent of six companies required to move an infantry division in one lift) (TO&E 10-57):	W-330	T-0

Division Total: W-2,033 T-246
(and 10 aircraft)

4. 80th Infantry Division (TO&E 7) with attachments. Exact march formation for the move northward from vicinity Sarre-Union is unknown, but the division contained the following units:

Division HQ (TO&E 7-1) and HC (TO&E 7-2):	W-31	T-0
317 Inf Regt (TO&E 7-11):	W-226	T-0
318 Inf Regt (TO&E 7-11):	W-226	T-0
319 Inf Regt (TO&E 7-11):	W-226	T-0
80 Recon Trp (TO&E 2-27):	W-38	T-5
305 Engr Bn (TO&E 5-15):	W-91	T-0
DIVARTY		
HHB (TO&E 6-10-1):	W-23	T-0
313 FA Bn (105-T)(TO&E 6-25):	W-90	T-0
314 FA Bn (105-T) (TO&E 6-25):	W-90	T-0
905 FA Bn (105-T) (TO&E 6-25):	W-90	T-0
315 FA Bn (155-T) (TO&E 6-335):	W-87	T-18
Service Troops		
HQ Svc Trps (TO&E 7-3):	W-3	T-0
80 Signal Co (TO&E 11-7):	W-56	T-0
__ Med Bn (TO&E 8-15):	W-70	T-0
__ Ord Co (TO&E 9-8):	W-29	T-0
__ QM Co (TO&E 10-17):	W-59	T-0
__ MP Plt (TO&E 19-7):	W-27	T-0
Attached Troops		
702 Tnk Bn (Separate) (TO&E 17-25):	W-71	T-99
808 TD Bn (SP) (released on 21 Dec following the move and 610 TD Bn attached) (TO&E 18-25):	W-120	T-39
633 AAA AW Bn (Mb1) (TO&E 44-25):	W-123	T-0
QM Trk Cos (equivalent of six companies required to move an infantry division in one lift) (TO&E 10-57):	W-330	T-0

Division Total: W-2,106 T-161 (and 10 aircraft)

5. III Corps Artillery. Two battalions (696 and 177) were previously assigned to, and moved north with, III Corps. One arty group HQ (404) and five battalions (179, 512, 752, 253, and 731) came from XII Corps. Two arty groups HQs (193 and 203) and three battalions (949, 274, and 176) came from XX Corps. The observation battalion (288) was newly arrived in theater. These units came from their various corps or (for the 288th) threater army areas and concentrated at an artillery concentration area vicinity Virton, where they were task organized:

193 FA Gp (attached 26 Inf Div)		
HHB (TO&E 6-12)	W-24	T-0
696 Armd FA Bn (105 SP) (TO&E 6-165):	W-58	T-53
179 FA Bn (155 HOW-T) (TO&E 6-335):	W-68	T-18
949 FA Bn (155 HOW-T) (TO&E 6-335):	W-68	T-18
404 FA Gp (attached 80 Inf Div)		
HHB (TO&E 6-12):	W-24	T-0
512 FA Bn (105-T) (TO&E 6-25):	W-82	T-0
752 FA Bn (155 HOW-T) (TO&E 6-335):	W-68	T-18
253 Armd FA Bn (105-SP) (attached 4 AD)(TO&E 6-165):	W-58	T-53
274 Armd FA Bn (105-SP) (attached 4 AD)(TO&E 6-165):	W-58	T-53

III Corps Arty

HHB (TO&E 6-50-1):	W-22	T-0
203 FA Gp (GS to Corps)		-
HHB (TO&E 6-12):	W-24	T-0
176 FA Bn (4.5" Gun-T) (TO&E 6-335):	W-68	T-18
177 FA Bn (155 HOW-T) (TO&E 6-335):	W-68	T-18
731 FA Bn (155 Gun-T) (TO&E 6-55):	W-77	T-0
288 Observation Bn (TO&E 6-75):	W-90	T-0
HQ 8 TD Gp (TO&E 18-10-1):	W-13	T-3

Corps Arty Total: W-870 T-252 (and 14 aircraft)

6. Other Corps Assets.

32 AAA Gp (Moved from vicinity Metz to vicinity Arlon.)

HHB (TO&E 44-12):	W-10	T-0
468 AAA AW Bn (SP) (TO&E 44-75):	W-50	T-81
Total:	W-60	T-81

TF Lion (Moved from III Corps sector to vicinity Rossignal.)

178 Engr Cbt Bn (- one company) (TO&E 5-15):	W-69	T-0
D/467 AAA AW Bn (SP) (TO&E 44-27):	W-6	T-19
1 Plt/770 Engr Dp Trk Co (TO&E 5-88):	W-25	T-0
1 Plt/632 Engr LE Co (TO&E 5-367):	W-20	T-0
Total:	W-120	T-19

94 Signal Bn (Corps) (TO&E 11-15) (Moved from Metz to vicinity Arlon.) W-200 T-0

821 MP Co (Corps) (TO&E 19-37): W-18 T-0
MP Plt (Corps) (TO&E 19-77): W-7 T-0
Total: W-25 T-0

1137 Engr Cbt Gp (Movement information is sketchy--a move from III Corps sector to vicinity Arlon will be assumed.)

HHC (TO&E 5-192):	W-15	T-0
183 Engr Cbt Bn (TO&E 5-15):	W-91	T-0
188 Engr Cbt Bn (DS to 4 AD) (TO&E 5-15):	W-91	T-0
145 Engr Cbt Bn (DS to 80 ID) (TO&E 5-15):	W-91	T-0
249 Engr Cbt Bn (DS to 26 ID) (TO&E 5-15):	W-91	T-0
770 Engr Dp Trk Co (-) (TO&E 5-88):	W-28	T-0
632 Engr LE Co (-) (TO&E 5-367):	W-38	T-0
72 Engr L Pon Co (TO&E 5-87):	W-76	T-0
513 Engr L Pon Co (TO&E 5-87):	W-76	T-0
998 Engr Treadway Bdg Co (TO&E 5-627):	W-66	T-1
Total:	W-663	T-1

7. Total III Corps Vehicles:

III Corps HQ:	W-40	T-0	Acft-0
4th Armd Div:	W-1,574	T-957	Acft-8
26th Inf Div:	W-2,033	T-242	Acft-10
80th Inf Div:	W-2,106	T-161	Acft-10

III Corps Arty:	W-870	T-252	Acft-14
32 AAA Group:	W-60	T-81	Acft-0
94 Signal Bn:	W-200	T-0	Acft-0
TF Lion:	W-120	T-19	Acft-0
821 MP Co (+):	W-25	T-0	Acft-0
1137 Engr Cbt Gp:	W-633	T-1	Acft-0
Total:	W-7,691	T-1,713	Acft-42

NOTES:

a. "W" stands for wheeled vehicles (combat or tactical) and "T" for tracked and half-tracked vehicles.

b. Order of Battle information is from Annex 3 to III Corps Field Order #1, dated 21 December 1944; 4 Armd Div Operating Instructions, dated 19 December 1944; and chapter 3 of MMAS Thesis, "Field Artillery Support for III Corps Attack 18-26 December," Fort Leavenworth, KS, 1985, MAJ Gregory V. Morton.

c. All above cited TO&Es are from chapter 1, War Department Field Manual 101-10, Staff Officers' Field Manual--Organization, Technical and Logistical Data, 21 December 1944. Vehicle counts were derived from the TO&Es contained in this FM. Units are portrayed at full-strengths.

d. The order of battle does not include some corps combat service support elements (notably medical, quartermaster, ordinance, finance, etc.), primarily because most of these elements did not move during the 18-22 December period but remained vicinity Metz, where a corps rear HQ remained in position. See Annex 3 to III Corps Field Order #1, 21 December 1944, for a specific listing.

e. Divisional and corps MP units are included in this order of battle; however, they were not actually part of the march columns but were instead heavily engaged in traffic control. Each division had an MP platoon, III Corps had an MP platoon and the 821 MP Co (III Corps FO #1, Annex #3, 23 Dec 44), and Third Army dedicated two MP battalions, the 503d and 512th, to traffic control (Third Army Afteraction Report, Volume II, Provost Marshal Section, p. 16).

Appendix B: XX Corps (AOE) Notional Order of Battle

1.	XX Corps HHC (TO&E 52-002H41, 28 Jun 74):	W-24	T-3
2.	23d Armored Division (6 M1 Bn, 4 BFV Bn, 2 AH-64 Bn).		
	Division HHC (TO&E 87-004J41, 1 Apr 84):	W-59	T-5
	1 Bde:		
	HHC (TO&E 87-042J41, 1 Apr 84):	W-20	T-8
	1-10 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
	1-11 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
	1-91 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
	1 FS Bn (TO&E 63-005J41, 1 Apr 84):	W-160	T-10
	A/1-440 ADA (G/S) (TO&E 44-167J4, 1 Apr 84):	W-44	T-25
	A/23 Engr (TO&E 5-147J4, 1 Apr 84):	W-26	T-27
	1 Bde Totals:	W-522	T-382
	2 Bde (TO&E references identical to 1 Bde):		
	HHC:	W-20	T-8
	1-12 AR:	W-85	T-98
	1-13 AR:	W-85	T-98
	1-92 Mech:	W-102	T-116
	2 FS Bn:	W-160	T-10
	B/1-440 ADA (G/S):	W-44	T-25
	B/23 Engr:	W-26	T-27
	2 Bde Totals:	W-522	T-382
	3 Bde:		
	HHC (TO&E 87-042J42, 1 Apr 84):	W-20	T-8
	1-14 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
	1-15 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
	1-93 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
	1-94 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
	3 FS Bn (TO&E 63-005J42, 1 Apr 84):	W-168	T-11
	C/1-440 ADA (G/S) (TO&E 44-167J4, 1 Apr 84):	W-44	T-25
	C/23 Engr (TO&E 5-147J4, 1 Apr 84):	W-26	T-27
	3 Bde Totals:	W-632	T-499
	23 CAB:		
	HHC (TO&E 17-202J4, 1 Apr 84):	W-25	T-0
	146 AHB (AH-64) (TO&E 1-385J52, 1 Apr 85):	W-66	T-0
	147 AHB (AH-64) (TO&E 1-385J52, 1 Apr 85):	W-66	T-0
	23 CAC (TO&E 1-257J42, 1 Apr 84):	W-33	T-0
	23 GSAC (TO&E 1-287J4, 1 Apr 84):	W-32	T-0
	23 CAB Totals: (and 104 aircraft)	W-222	T-0

23 DIVARTY:

HHB (TO&E 6-302J4, 1 Oct 82):	W-50	T-1
1-50 FA (155-SP) (TO&E 6-365J41, 1 Oct 82):	W-117	T-77
1-51 FA (155-SP) (TO&E 6-365J41, 1 Oct 82):	W-117	T-77
1-52 FA (155-SP) (TO&E 6-365J43, 1 Oct 82):	W-118	T-82
23 TAB (TO&E 6-307J4, 1 Oct 82):	W-32	T-0
23 MLRS (TO&E 6-398J4, 1 Oct 82):	W-42	T-13
23 DIVARTY Totals:	W-476	T-250

Division Troops:

1-22 CAV (TO&E 17-205J42, 1 Apr 84):	W-92	T-71
1-440 ADA (G/S) (-) (TO&E 44-165J4, 1 Apr 84):	W-59	T-1
23 Engr (Ribbon) (-) (TO&E 5-145J41, 1 Apr 84):	W-122	T-35
23 MI Bn (CEWI) (TO&E 34-285J4, 1 Apr 84):	W-81	T-26
23 Sig Bn (TO&E 11-35J5, 1 Apr85):	W-221	T-0
23 Chem Co (TO&E 3-387J4, 1 Apr 84):	W-49	T-6
23 MP Co (TO&E 19-217J4, 1 Apr 84):	W-48	T-0
Div Troop Totals:	W-672	T-139 (and 21 aircraft)

23 DISCOM:

HHC/MMC (TO&E 63-002J4, 1Apr 84):	W-49	T-0
23 MS Bn (TO&E 63-135J4, 1 Apr 84):	W-413	T-4
23 AMC (TO&E 55-427J41, 1 Apr 84):	W-36	T-0
23 DISCOM Totals: (and 2 aircraft)	W-498	T-4

23 AD Totals: W-3,603 T-1,661 (and 127 aircraft)

3. 52d Mechanized Division (5 M1 Bn, 5 BFV Bn, 2 AH-64 Bn).

Division HHC (TO&E 87-004J42, 1 Apr 84):	W-58	T-5

1 Bde:

HHC (TO&E 87-042J41, 1 Apr 84):	W-20	T-8
1-2 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
1-3 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
1-77 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
1 FS Bn (TO&E 63-005J41, 1 Apr 84):	W-160	T-10
A/1-441 ADA (G/S) (TO&E 44-167J4, 1 Apr 84):	W-44	T-25
A/52 Engr (TO&E 5-147J41, 1 Apr 84):	W-26	T-27
1st Bde Totals:	W-522	T-382

2 Bde:

HHC (TO&E 87-042J42, 1 Apr 84):	W-20	T-8
1-4 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
1-78 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
1-79 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
2 FS Bn (TO&E 63-005J43, 1 Apr 84):	W-160	T-10
B/1-441 ADA (G/S) (TO&E 44-167J4, 1 Apr 84):	W-44	T-25
B/52 Engr (TO&E 5-147J41, 1 Apr 84):	W-26	T-27
2d Bde Totals:	W-539	T-400

3 Bde:

HHC (TO&E 87-042J42, 1 Apr 84):	W-20	T-8
1-5 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
1-25 AR (TO&E 17-235J42, 1 Apr 85):	W-85	T-98
1-80 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
1-81 Mech (TO&E 7-245J41, 1 Apr 83):	W-102	T-116
3 FS Bn (TO&E 63-005J42, 1 Apr 84):	W-168	T-11
C/1-441 ADA (G/S) (TO&E 44-167J4, 1 Apr 84):	W-44	T-25
C/52 Engr (TO&E 5-147J41, 1 Apr 84):	W-26	T-27
3d Bde Totals:	W-632	T-499

52 CAB (TO&E references and organization identical to 23 AD CAB):

HHC:	W-25	T-0
151 AHB (AH-64):	W-66	T-0
152 AHB (AH-64):	W-66	T-0
52 CAC:	W-33	T-0
52 GSAC:	W-32	T-0
52 CAB Totals: (and 104 aircraft)	W-222	T-0

52 DIVARTY:

HHB (TO&E 6-302J4, 1 Oct 82):	W-50	T-1
1-40 FA (155-SP) (TO&E 6-365J41, 1 Oct 82):	W-117	T-77
1-41 FA (155-SP) (TO&E 6-365J42, 1 Oct 82):	W-116	T-77
1-42 FA (155-SP) (TO&E 6-365J43, 1 Oct 82):	W-118	T-82
52 TAB (TO&E 6-307J4, 1 Oct 82):	W-32	T-0
52 MLRS (TO&E 6-398J4, 1 Oct 82):	W-42	T-13
52 DIVARTY Totals:	W-475	T-250

Division Troops (TO&E references and organization identical to 23 AD):

1-23 Cav:	W-92	T-71
1-441 ADA (G/S) (-):	W-59	T-1
52 Engr (-):	W-122	T-35
52 MI Bn (CEWI):	W-81	T-26
52 Sig Bn:	W-221	T-0
52 Chem Co:	W-49	T-6
52 MP Co:	W-48	T-0
Div Troops Totals: (and 21 aircraft)	W-672	T-133

DISCOM):

HHC/MMC	W-49	T-0
52 MS Bn:	W-413	T-4
52 AMC:	W-36	T-0
52 DISCOM Totals: (and 2 aircraft)	W-498	T-4

52 Mech Div Totals: W-3,618 T-1,673 (and 127 aircraft)

4. 53d Mechanized Division (TO&E references and organizations are identical to the 52d Mech Div. Unit designations and strength totals only are provided below.)

Division HHC: W-58 T-5

1 Bde (totals: W-522 T-382)
- HHC
- 2-10 AR
- 2-11 AR
- 2-91 Mech
- A/2-441 ADA (G/S)
- A/53 Engr
- 1 FS Bn

2 Bde (totals: W-539 T-400):
- HHC
- 2-4 AR
- 2-78 Mech
- 2-79 Mech
- B/2-441 ADA (G/S)
- B/53 Engr
- 2 FS Bn

3 Bde (totals: W-632 T-499):
- HHC
- 2-5 AR
- 2-25 AR
- 2-80 Mech
- 2-81 Mech
- C/2-441 ADA (G/S)
- C/53 Engr
- 3 FS Bn

53 CAB (totals: W-222 T-0 (and 104 aircraft):
- HHC
- 153 AHB (AH-64)
- 154 AHB (AH-64)
- 53 CAC
- 53 GSAC

53 DIVARTY (totals: W-475 T:250):
- HHB
- 2-40 FA (155-SP)
- 2-41 FA (155-SP)
- 2-42 FA (155-SP)
- 53 TAB
- 53 MLRS

Division Troops (totals: W-672 T-133 and 21 aircraft):
- 2-23 CAV
- 2-441 ADA (G/S) (-)
- 53 Engr (Ribbon) (-)
- 53 MI Bn (CEWI)
- 53 Chem Co
- 53 MP Co

53 DISCOM (totals: W-498 T-4 and 2 aircraft)
- HHC/MMC
- 53 MS Bn
- 53 AMC

53 Mech Div Totals: W-3,618 T-1,679 and 127 aircraft)

5. XX Corps Artillery.

61 FA Bde (atchd 23 AD):		
HHB (TO&E 6-401J31, 1 Oct 83):	W-43	T-0
2-637 FA (155-SP) (TO&E 6-365J41, 1 Oct 82):	W-117	T-77
2-640 FA (155-SP) (TO&E 6-365J41, 1 Oct 82):	W-117	T-77
2-606 FA (203-SP) (TO&E 6-445J42, 1 Apr 84):	W-100	T-60
61 FA Bde Totals:	W-377	T-214

62 FA Bde (attached 52 Mech Div) Same TO&E references and organization as 61 FA Bde:

HHB:	W-43	T-0
2-638 FA (155-SP):	W-117	T-77
2-641 FA (155-SP):	W-117	T-77
2-607 FA (203-SP):	W-100	T-60
62 FA Bde Totals:	W-377	T-214

63 FA Bde (attached 53 Mech Div) Same TO&E references and organization as 61 FA Bde:

HHB:	W-43	T-0
2-639 FA (155-SP):	W-117	T-77
2-642 FA (155-SP):	W-117	T-77
2-608 FA (203-SP):	W-100	T-60
63 FA Bde Totals:	W-377	T-214

64 FA Bde (GS to corps):		
HHB (TO&E 6-401J31, 1 Oct 83):	W-43	T-0
1-205 FA (Lance) (TO&E 6-595H4, 30 Sep 74):	W-124	T-19
1-206 FA (Lance) (TO&E 6-595H4, 30 Sep 74):	W-124	T-19
1-662 FA (MLRS) (TO&E 6-525J3, 1 Oct 83):	W-152	T-42
64 FA Bde Totals:	W-443	T-80
Corps Artillery Totals:	W-1,574	T-722

6. Other Corps Assets.

208 ACR (TO&E 17-051J33, 1 Apr 83):	W-1,023 (and 74 aircraft)	T-561
10 ADA Bde:		
HHB (TO&E 44-002H6, 31 Aug 76):	W-11	T-0
401 ADA Gp:		
HHB (TO&E 44-012H6, 31 Aug 76):	W-17	T-0
1-430 ADA (Chap) (TO&E 44-345J4, 1 Oct 84):	W-87	T-51
1-431 ADA (Chap) (TO&E 44-345J4, 1 Oct 84):	W-87	T-51
402 ADA Gp:		
HHB (TO&E 44-012H6, 31 Aug 76):	W-17	T-0
2-461 ADA (HAWK) (TO&E 44-245H22, 25 Aug 72):	W-209	T-0
2-462 ADA (HAWK) (TO&E 44-245H22, 25 Aug 72):	W-209	T-0
10 ADA Bde Totals:	W-637	T-102

51st Engr Bde:		
HHD (TO&E 5-101H61, 16 Aug 76):	W-16	T-0
60 Engr Gp:		
HHD (TO&E 5-052H6, 16 Aug 76):	W-17	T-0
500 Engr Cbt Bn (TO&E 5-035H5, 28 Feb 75):	W-196	T-18
501 Engr Cbt Bn (TO&E 5-035H5, 28 Feb 75):	W-196	T-18
502 Engr Cbt Bn (TO&E 5-035H5, 28 Feb 75):	W-196	T-18
5035 Engr Pnl Bdg Co (TO&E 5-077J2, 1 Oct 82):	W-45	T-0
5080 Engr Cbt Spt Equip Co (TO&E 5-052H4, 29 Nov 74):	W-106	T-0
5045 Engr Aslt Fltbdg Co (Ribbon) (TO&E 5-079J2, 1 Oct 82):	W-71	T-2
61 Engr Gp:		
HHD (TO&E 5-052H6, 16 Aug 76):	W-17	T-0
503 Engr Cbt Bn (TO&E 5-035H5, 28 Feb 75):	W-196	T-18
504 Engr Cbt Bn (TO&E 5-035H5, 28 Feb 75):	W-196	T-18
550 Engr Cbt Bn (Hvy) (TO&E 5-115H3, 29 Jun 73):	W-220	T-0
5006 Engr Dptrk Co (TO&E 5-124H6, 20 Feb 76):	W-38	T-0
5036 Engr Pnl Bdg Co (TO&E 5-077J2, 1 Oct 82):	W-45	T-0
5081 Engr Cbt Spt Equip Co (TO&E 5-058H4, 29 Nov 74):	W-106	T-0
5059 Engr Mdm Girder Bdg Co (TO&E 5-074J2, 2 Oct 82):	W-44	T-0
51 Engr Bde Totals:	W-1,705	T-92
	(and 14 aircraft)	
20 MI GP (CEWI):		
HHD (TO&E 34-102J11, 4 Mar 81):	W-13	T-0
200 MI Bn (CEWI) (Aerial Xplt) (TO&E 34-145J, 12 Dec 80):	W-77	T-0
210 MI Bn (CEWI) (Tac Xplt) (TO&E 34-125J11, 4 Mar 81):	W-153	T-6
220 MI Bn (CEWI) (Op) (TO&E 34-105J11, 4 Mar 81)	W-124	T-1
20 MI Gp Totals:	W-367	T-7
	(and 26 aircraft)	
70 Signal Bde:		
HHC (TO&E 11-402H7, 8 Apr 77):	W-33	T-0
700 Sig Bn (Co) (TO&E 11-405H72, 9 May 77):	W-125	T-0
712 Sig Rdo Bn (TO&E 11-425H7, 9 May 77):	W-216	T-0
704 Area Sig Bn (TO&E 11-415H72, 16 Aug 76):	W-243	T-0
705 Area Sig Bn (TO&E 11-415H72, 16 Aug 76):	W-243	T-0
706 Area Sig Bn (TO&E 11-415H72, 16 Aug 76):	W-243	T-0
70 Sig Bn Totals:	W-1,103	T-0
	(and 15 aircraft)	

40 Chem Bde:

HHC (TO&E 3-012J5, 1 Apr 85):	W-11	T-0
400 Chem Bn:		
HHD (TO&E 3-116J3, 1 Apr 83):	W-17	T-0
411 Chem Decon Co (TO&E 3-017J3, 1 Apr 83):	W-57	T-0
412 Chem Decon Co (TO&E 3-017J3, 1 Apr 83):	W-57	T-0
___ Chem Recon Co (TO&E 3-307J4, 1 Oct 84):	W-46	T-0
401 Chem Bn:		
HHD (TO&E 3-116J3, 1 Apr 83):	W-17	T-0
421 Smk Genr Co (Mech) (TO&E 3-007J3, 1 Apr 83):	W-15	T-23
422 Smk Genr Co (Mech) (TO&E 3-007J3, 1 Apr 83):	W-15	T-23
423 Smk Genr Co (Mech) (TO&E 3-007J3, 1 Apr 83):	W-15	T-23
441 Smk Genr Co (Mtzd) (TO&E 3-067J1, 1 Apr 81):	W-55	T-0
40 Chem Bde Totals:	W-305	T-69

26 MP Gp:

HHC (TO&E 19-272H42, 2 Sep 74):	W-13	T-0
230 MP Bn:		
HHD (TO&E 19-076H4, 28 Feb 74):	W-14	T-0
270 MP Co (TO&E 19-077J21, 1 Apr 82):	W-49	T-0
271 MP Co (TO&E 19-077J21, 1 Apr 82):	W-49	T-0
272 MP Co (TO&E 19-077J21, 1 Apr 82):	W-49	T-0
231 MP Bn (TO&E references and organization identical to 230 MP Bn):		
HHD:	W-14	T-0
273 MP Co:	W-49	T-0
274 MP Co:	W-49	T-0
275 MP Co:	W-49	T-0
26 MP Gp Totals:	W-335	T-0 (and 5 aircraft)

7. Total XX Corps Vehicles:

XX Corps HHC	W-24	T-3	Aircraft-0
23 Armd Div	W-3,603	T-1,661	Aircraft-127
52 Mech Div	W-3,618	T-1,673	Aircraft-127
53 Mech Div	W-3,618	T-1,673	Aircraft-127
XX Corps Arty	W-1,574	T-722	Aircraft-0
208 ACR	W-1,023	T-516	Aircraft-74
10 ADA Bde	W-637	T-102	Aircraft-0
51 Engr Bde	W-1,705	T-92	Aircraft-14
20 MI Gp	W-367	T-7	Aircraft-26
70 Sig Bde	W-1,103	T-0	Aircraft-15
40 Chem Bde	W-305	T-69	Aircraft-0
26 MP Gp	W-335	T-0	Aircraft-5
Totals:	W-17,912	T-6,518	Aircraft-515

NOTES:

a. "W" stands for wheeled vehicles and "T" for tracked.

b. Notional unit designations are as used for instructional purposes at USACGSC. (See Student Text 101-1, chapters 1 and 2, June 1985).

c. Judgment calls were required in counting vehicles that were capable of long distance roadmarching, particularly in the area of engineer equipment. Those vehicles that would probably move by lowbed (bulldozers, forklifts, etc) were not counted.

d. Wherever possible, J-Series (Army of Excellence) TO&Es were used. This was not always possible, particularly for some corps-level assets, in which case H-series TO&Es were used. In the case of the corps combat aviation brigade, no TO&E is yet available, and therefore a corps CAB has not been included in the notional order of battle.

e. Division bands are not listed because they contain no vehicles.

f. Divisional and corps MPs, although included in the order of battle, are not included in any roadmarch calculations as it is assumed they will be heavily engaged in traffic control.

g. All divisional-level assets are included in this order of battle. At the corps level, only combat and combat support assets are depicted. Combat service support assets found in the COSCOM are not included.

Appendix C: 8th Combined Arms Army Notional Order of Battle

1. 8 CAA HQ and Security and Services Battalion:	W-200	T-10
2. 39 MRD:		
HHC:	W-47	T-0
144 MRR (BMP):	W-324	T-192
146 MRR (BTR):	W-461	T-55
150 MRR (BTR):	W-461	T-55
131 TR:	W-286	T-139
86 Arty Regt:	W-335	T-32
29 SAM Regt (SA-6):	W-157	T-20
39 SSM Bn (FROG-7):	W-42	T-0
39 Helicopter Sqdn:	W-35	T-0
39 AT Bn:	W-41	T-14
39 Recon Bn:	W-63	T-21
39 Engr Bn:	W-109	T-37
39 Sig Bn:	W-76	T-0
39 Mtr Trans Bn:	W-296	T-0
39 Maint Bn:	W-87	T-7
39 Chem Def Bn:	W-76	T-0
39 Med Bn:	W-69	T-0
39 Arty Cmd Bn:	W-14	T-0
39 Mbl Fld Bakery:	W-12	T-0
39 MRD Totals:	W-2,991	T-572 (and 18 aircraft)

3. 120 GMRD (Unit strengths are identical to 39 MRD):

HHC	120 Helo Sqdn
59 GMRR (BMP)	120 AT Bn
84 GMRR (BTR)	120 Recon Bn
12 GMRR (BTR)	120 Engr Bn
86 GTR	120 Signal Bn
21 Arty Regt	120 Mtr Trans Bn
77 SAM Regt (SA-6)	120 Maint Bn
120 SSM Bn (FROG-7)	120 Chem Def Bn
120 Med Bn	
120 Arty Cmd Bn	
120 Mbl Fld Bakery	

120 GMRD Totals: W-2,991 T-572 (and 18 aircraft)

4. 79 TD:

HHC:	W-47	T-0
182 TR:	W-280	T-175
186 TR:	W-280	T-175
190 TR:	W-280	T-175
165 MRR (BMP):	W-324	T-192
28 Arty Regt:	W-335	T-32
74 SAM Regt (SA-6):	W-157	T-20
79 SSM Bn (FROG-7):	W-42	T-0
79 Helo Sqdn:	W-35	T-0
79 Recon Bn:	W-63	T-21
79 Engr Bn:	W-109	T-37
79 Signal Bn:	W-76	T-0
79 Mtr Trans Bn:	W-296	T-0
79 Maint Bn:	W-87	T-7
79 Chem Def Bn:	W-76	T-0
79 Med Bn:	W-69	T-0
79 Arty Cmd Bn:	W-14	T-0
79 Mbl Fld Bakery:	W-12	T-0
79 TD Totals):	W-2,582	T-834
	(and 18 aircraft)	

5. 8th CAA Assets:

110 Arty Bde: (3 ea bns 152-HOW) (2 ea bns 152-GUN)	W-475	T-49
19 SAM Regt: (3 ea bns SA-4)	W-268	T-38
13 AT Regt: (3 ea bns 100-GUN/BRDM-AT)	W-247	T-52
30 MRL Regt: (3 ea bns BM-21)	W-322	T-6
3 SSM Bde: (3 ea bns SCUD-B)	W-308	T-8
64 Engr Regt: (3 ea engr bns) (1 ea construction bn)	W-192	T-119
139 Ponton Bdg Regt: (2 ea ponton bns) (1 ea tech co)	W-188	T-25
55 Aslt Crossing Bn:	W-16	T-88
4 Atk Helo Regt (w/attached spt ele): (2 ea bns of HIND) (1 ea bn of HIP)	W-120	T-0

5. 8th CAA Assets (Continued)

8 Gen Purpose Helo Sqdn (w/attached spt ele): (HIP/HOOK/HOPLITE)	W-30	T-0
57 Intel Bn:	W-75	T-0
58 Signal Regt:	W-250	T-0
75 Radio and Radar Intercept Bn:	W-90	T-10
4 Early Warning Bn:	W-60	T-0
8 Arty C2 Bn:	W-20	T-0
8th CAA Assets Totals:	W-2,661	T-395 (and 82 aircraft)

6. 8 CAA Vehicle Totals:

8 CAA HQ/S and S Bn:	W-200	T-10
39 MRD:	W-2,991	T-572
120 GMRD:	W-2,991	T-572
79 TD:	W-2,589	T-834
8 CAA Assets:	W-2,661	T-395
Totals:	W-11,431	T-2,383 (and 136 aircraft)

NOTES:

a. "W" stands for wheeled vehicles (combat and tactical) and "T" stands for tracked.

b. Notional unit designations are as used in USACGSC instructional material, 1984-85.

c. All divisional-unit and the army engineer-unit vehicle counts are taken from FM 100-2-3, The Soviet Army Troops, Organization and Equipment, 1984. Other army-level unit vehicle counts are only approximate and were derived from a combination of sources, primarily FM 100-2-3 and from information provided by Combined Arms Center Threat Directorate, Fort Leavenworth.

d. As was the case in US XX Corps (AOE), combat service support assets above division level are not depicted in the above order of battle. This was done primarily to allow a comparison between roughly similar-sized forces (a three-division CAA and a three-plus division US corps). The 8 CAA would also contain a motor transport regiment (3 ea trans bns and a POL bn) containing approximately 735 vehicles. Additional vehicles would be present as part of the CAA rear services.

e. The CAA depicted in this appendix includes no front-level assets. Assuming that this CAA is part of a front's operational second echelon, the lack of front assets is not unusual.

Appendix D: U.S. Army-of-Excellence Versus Soviet Force Comparisons

	AOE Mech Div	Soviet MRD	AOE AR Div	Soviet Tank Div	XX Corps Assets	Soviet 8 CAA Assets	TOTALS: US XX Corps	Soviet 8 CAA
Tanks	290	220	348	328	123	5	1,051	773
APC/IFV	653	558	587	426	189	12	2,082	1,554
AT Systems	60	48	48	9	--	63	168	168
Aircraft	127	18	127	18	134	82	515	132
ADA Systems	36	52	36	52	132	51	240	207
SSM	--	4	--	4	12	12	12	24
Arty	72	126	72	126	240	90	432	468
MLRS	9	18	9	18	27	54	54	98
Total Vehicles	5,291	3,563	5,264	3,423	8,584	3,266	24,430	13,814

NOTES:

a. Tanks include M1s (US) and T64/72s (Soviet).

b. APCs/IFVs include M2s/M3s/M113s (US) and BMPs/BTRs and BRDM Recon Variants (Soviet).

c. AT systems include ITVs (US) and AT guns/BRDM AT Variants (Soviet).

d. ADA systems include Vulcans/Sgt Yorks/Chaparral/Hawk (US) and SA-4/SA-6/SA-9/ZSU-23/ZSU-23-4 (Soviet).

e. Aircraft includes all helicopters and fixed wing assets (US) and helicopters (Soviet).

f. SSM systems are Lance (US) and FROG/SCUD (Soviet).

g. Artillery includes 155/203 (US) and 122/152 (Soviet).

h. MLRS is MLRS (US) and BM-21 (Soviet).

i. "Total vehicles" are not a total of each column, but rather the total number of vehicles organic to the formation (per the vehicle counts in Appendixes B and C).

j. Sources for these vehicle counts are the same as used to determine the vehicle counts in Appendixes B and C. The divisions represented here are not augmented with any nondivisional assets.

Appendix E: III U.S. Corps March Computations.

Unit/ Convoy	No of Vehicles	No of Serials	No of MUs	DAY MARCH (20 VPK) PST (hr:min)	DAY MARCH (20 VPK) Road Space (km)	NIGHT MARCH (40 VPK) PST (hr:min)	NIGHT MARCH (40 VPK) Road Space (km)
1. 4 AD:							
HQ	34	1	--	:06	1.7	:06	.85
CCA	889	6	30	4:22	104.52	4:22	52.25
CCB	542	4	18	2:36	62.5	2:36	31.25
CCR	681	5	23	3:21	80.17	3:21	40.09
Div Trains	385	3	13	1:56	43.92	1:56	21.97
2. 26 ID (identical data applies to 80 ID except for 8 fewer vehicles in division troops):							
26 Recon Trp	43	1	--	:08	2.15	:08	1.08
101 IR	336	4	11	1:40	40.94	1:40	20.47
104 IR	336	4	11	1:40	40.94	1:40	20.47
328 IR	336	4	11	1:40	40.94	1:40	20.47
HQ & Div Trps	582	5	20	2:57	70.4	2:57	35.2
DIVARTY	398	4	13	1:56	47.25	1:56	23.63
Svc Trps	217	2	7	:58	23.19	:58	11.6
3. III Corps Assets:							
Arty with III Corps	325	3	11	1:35	37.7	1:35	18.86
Arty from XII Corps	466	5	16	2:25	58.16	2:25	29.08
Arty from XX Corps	331	3	11	1:35	38.0	1:35	19.01
32 AAA Gp	141	1	5	:37	13.49	:37	6.75
TF Lion	139	1	5	:37	13.39	:37	6.7
94th Sig Bn	200	2	7	:58	22.34	:58	11.17
1137 Engr Gp	664	5	22	3:13	77.72	3:13	38.86

Notes:

a. Unit organization and vehicle counts shown above are as per III Corps Order of Battle listed in Appendix A. The 4th Armd Div organization for the march is identical to that listed in Appendix A. The divisional formations of the 26th and 80th Inf Divs shown in Appendix A are further grouped in this appendix for march planning as follows: Division MPs are not counted (as they are assumed to be on traffic control duty); HQ and Div Trps includes the HHC, engineer battalion, attached tank battalion, attached TD battalion, and attached AAA AW battalion; and each infantry regiment includes two of the six attached QM truck companies. The 80th Infantry Division is

virtually identical in organization and vehicle count to the 26th Infantry Division, and for this reason a separate set of march data was not developed (the 80th Infantry Division has eight fewer vehicles than the 26th Infantry Division, reflecting the difference between the vehicle counts in an AAA AW battalion (mobile) versus an AAA AW battalion (self-propelled). The III Corps artillery as organized in this appendix reflects the location from which they had to march to arrive at the III Corps artillery concentration area, whereas the organization at Appendix A reflects how they were task organized upon arrival.

b. March data and procedures used in these calculations are generally derived from 3d U. S. Army Circular #10, "Traffic Regulation and Control for Continental Operation," 4 May 1944: March units (MUs) will not exceed 30 vehicles (march unit size used in these calculations is between 28 and 31), serials will not exceed five march units (serial size varies from 0 to 5 march units), day convoy speed will not exceed 25 MPH (20 Mih/32.18 Kmih was used), night convoy speed will not exceed 15 MPH (10 Mih/16.09 Kmih was used), vehicle interval will be approximately 75 yards/68.6 meters (50 meters day interval was used--the circular must be referring only to a daytime interval as 75 yards at night under blackout conditions is excessive--25 meters night interval was used), march-unit time interval will be 3 minutes, and serial interval 8 minutes.

c. Pass times (PST) for individual march units (the aggregate of which, coupled with march-unit time intervals and serial time intervals, provides the overall convoy pass times shown above) were calcuated using the Pass-Time Table, Extra-Time Allowance (EXTAL) Table, and procedures outlined in Appendix H (Roadmarches and Assembly Areas) to FM 71-2, The Tank and Mechanized Infantry Battalion Task Force, 30 June 1977.

d. Road space (the number of kilometers a convoy will occupy while marching) was determined using the Road-Space Formula found in Appendix E (Computation of a Highway Move) to FM 55-10, Army Movement Management Units and Procedures, January 1977.

e. Road gaps between convoys (not shown in the above calculations) will be planned using a 15-minute time gap, which results in 8.05 kilmometers of road gap day and 4.02 kilometers of road gap night.

Appendix F: XX Corps (AOE) March Computations

Unit/ Convoy	No of Vehicles	No of Serials	No of MUs	DAY MARCH (20 VPK) PST (hr:min)	DAY MARCH (20 VPK) Road Space (km)	DAY MARCH (10 VPK) PST (hr:min)	DAY MARCH (10 VPK) Road Space (km)	NIGHT MARCH (40 VPK) PST (hr:min)	NIGHT MARCH (40 VPK) Road Space (km)
1. 23 AD									
1 Bde	904	5	30	3:40	82.74	4:40	127.94	3:40	41.37
2 Bde	904	5	30	3:40	82.74	4:40	127.94	3:40	41.37
3 Bde	1,131	6	37	4:32	103.21	5:46	159.76	4:32	51.61
CAB	222	2	7	:50	19.15	1:09	30.25	:50	9.57
DIVARTY	726	4	24	2:55	65.8	3:43	102.1	2:55	32.9
HHC/Div Trps	664	4	22	2:41	60.55	3:25	93.75	2:41	30.28
Cav Sqdn	163	1	5	:36	12.44	:48	20.59	:36	6.23
DISCOM	502	3	16	1:56	41.73	2:34	66:83	1:56	20.86
2. 52 and 53 Mech Div:									
1 Bde	904	5	30	3:40	82.74	4:40	127.94	3:40	41.37
2 Bde	939	5	31	3:47	85.57	4:49	132.54	3:47	42.79
3 Bde	1,131	6	37	4:32	103.21	5:46	159.76	4:32	51.61
CAB	222	2	7	:50	19.15	1:09	30.25	:50	9.57
DIVARTY	725	4	24	2:55	65.75	3:43	102.0	2:55	32.88
HHC/Div Trps	657	4	21	2:34	59.13	3:22	91.98	2:34	29.57
Cav Sqdn	163	1	5	:36	12.44	:48	20.59	:36	6.23
DISCOM	502	3	16	1:56	41.73	2:34	66.83	1:56	20.86
3. Corps Assets:									
61-63 FA Bdes (each)	591	3	19	2:17	46.71	2:57	76.26	2:17	23.36
64 FA Bde	523	3	17	2:03	41.17	2:37	67.32	2:03	20.59
208 ACR	1,539	5	51	6:07	137.02	7:49	213.97	6:07	68.51
10 ADA Bde	739	4	24	2:55	66.45	3:43	103.4	2:55	33.23
51 Engr Bde	1,797	8	59	7:12	163.33	9:10	253.18	7:12	81.67
20 MI Gp	374	3	12	1:28	33.72	1:54	52.42	1:28	16.86
70 Sig Bde	1,103	5	36	4:22	99.13	5:34	154.28	4:22	49.57
40 Chem Bde	374	2	12	1:25	32.11	1:51	50.81	1:25	16.05

NOTES:

a. Unit organization and vehicle counts shown above are as per XX Corps Order of Battle listed in Appendix B, with the exception of the MP organizations (which are not counted, as they are being used for traffic control) and of the divisional cavalry squadrons (which were taken out of the division-troops list to permit their separate employment as lead elements of the march.)

b. Number of serials roughly equates to battalion equivalents and contain from three to seven march units.

c. March units (MUs) include from 30 to 33 vehicles.

d. The day march (20 VPK) was planned with a vehicle interval of 50 meters, a rate of march of 20-miles-in-the-hour (32.18 Kmih), a march-unit time gap of 2 minutes, and a serial time gap of 5 minutes.

e. The day march (10 VPK) was planned with the same data as the 20 VPK march, with the exception of the vehicle interval, which was increased to 100 meters.

f. The night march (40 VPK) was planned with a 25 meter vehicle interval, a rate of march of 10 miles-in-the-hour (16.09 Kmih), a march-unit time gap of 2 minutes, and a serial time gap of 5 minutes.

g. Pass times (PST) for individual march units (the aggregate of which, coupled with march-unit time gaps and serial time gaps, provide the overall convoy PSTs listed above) were calculated using the Pass-Time Table, Extra-Time Allowance (EXTAL) Table, and procedures outlined in Appendix H (Roadmarches and Assembly Areas) to FM 71-2, The Tank and Mechanized Infantry Battalion Task Force, 30 June 1977.

h. Road Space (the number of kilometers a convoy will occupy while marching) was determined using a formula found in Appendix E (Computation of a Highway Move) to FM 55-10, Army Movement Management Units and Procedures, January 1977.

i. Road gaps between convoys (not shown in the above calculations) will be planned using a 15-minute time gap, which results in 8.05 kilometers of road gap day and 4.02 kilometers night. Total road space for a division can thus be obtained by adding up the pass times for the division's subordinate convoys listed above and adding in the road gaps between convoys. The same procedure applies for total pass time, adding in the convoy time gaps.

Appendix G: 8th Combined Arms Army March Computations

Unit/ Convoy	No of Vehicles	No of Serials	DAY MARCH (20 VPK) PST (hr:min)	DAY MARCH (20 VPK) Road Space (km)	NIGHT MARCH (40 VPK) PST (hr:min)	NIGHT MARCH (40 VPK) Road Space (km)
1. 79 TD						
182 TR	455	6	2:08	49.57	2:08	24.79
186 TR	455	6	2:08	49.57	2:08	24.79
190 TR	455	6	2:08	49.57	2:08	24.79
165 MRR	516	6	2:14	52.62	2:14	26.31
28 Arty Regt	409	4	1:38	36.54	1:38	18.28
Recon Bn	84	1	:14	4.2	:14	2.1
HHC/Div Trps	571	4	2:02	44.64	2:02	22.33
Div Rear Svcs	471	3	1:38	34.28	1:38	17:14
2. 39 MRD (identical data applies to 120 GMRD):						
144 MRR	516	6	2:14	52.62	2:14	26.31
146 MRR	516	6	2:14	52.62	2:14	26.31
150 MRR	516	6	2:14	52.62	2:14	26.31
131 TR	425	6	2:02	48.07	2:02	24.04
86 Arty Regt	409	4	1:38	36.54	1:38	18.28
Recon Bn	84	1	:14	4.2	:14	2.1
HHC/Div Trps	626	4	2:14	47.39	2:14	23.7
Div Rear Svcs	471	3	1:38	34.28	1:38	17.14
3. 8 CAA Assets:						
HHC (w/S&S Bn and arty C2 Bn)	230	2	:50	16.861	:50	8.43
110 Arty Bde	524	5	2:05	47.65	2:05	23.83
19 SAM Regt	306	3	1:11	26:03	1:11	13.01
13 AT Regt	299	3	1:11	25.68	1:11	12.84
30 MRL Regt	328	3	1:14	27.13	1:14	13.56
3 SSM Bde	316	3	1:14	26.53	1:14	13.26
64 Engr Regt	311	4	1:22	31.64	1:22	15.83
139 Ponton Bdg Regt	213	2	:46	16.02	:46	8.01
55 Aslt Crossing Bn	104	1	:17	5.2	:17	2.6
4 Atk Helo Regt (w/8 GP Helo Sqdn atchd)	150	1	:25	7.5	:25	3.75
57 Intel Bn	75	1	:13	3.5	:13	1.75
58 Sig Regt	250	2	:52	17.86	:52	8.93
75 Rdo/Rdr Incpt Bn	100	1	:07	5.0	:07	2.5
4 Early Wrng Bn	60	1	:10	3.0	:10	1.5

NOTES:

a. Unit organizations and vehicle counts shown above are as per 8 CAA order of battle listed in Appendix C. The divisional organizations in Appendix C are further grouped above for march planning as follows: Artillery regiments include the SSM battalion; HHC and division troops include the SAM regiment, helo squadron, engineer battalion, signal battalion, chemical defense battalion, AT battalion (in the MRDs), and artillery command battalion: and division rear services include motor transport battalion, maintenance battalion, medical battalion, and mobile field bakery.

b. Soviet march data and procedures are outlined in chapter 5 of FM 100-2-1, The Soviet Army: Operations and Tactics (16 July 1984): Average march rates for mixed columns are 20-30 Kmih day (32.18 Kmih was used to permit comparison to U.S. march formations) and 15-20 Kmih at night (16.09 Kmih was used); normal vehicle interval is 25-50 meters (50 meters day and 25 meters night intervals were used); there are no march intervals between companies (hence, these calculations do not include company-sized "march units" as do the U.S. calculations); and gaps between battalions (serials) are 3-5 kilometers (a 10-minute serial gap was used, which gives a 5.36 kilometer gap for the day march and a 2.7 kilometer gap for the night march).

c. Convoy pass times (PST) were calculated using the Pass-Time Table, Extra-Time Allowance (EXTAL) Table, and procedures as outlined in Appendix H (Roadmarches and Assembly Areas) to FM 71-2, The Tank and Mechanized Infantry Battalion Task Force (30 June 1977).

d. Road Space (the number of kilometers a convoy will occupy while marching) was determined using a formula found in Appendix E (Computation of a Highway Move) to FM 55-10, Army Movement Management Units and Procedures (January 1977).

e. Road gaps between convoys (not shown in the above calculations) will be planned using a 15-minute gap, which results in 8.05 kilometers of road gap day and 4.02 kilometers night. (This approximates the 5-10 kilometers distance between regiments on the march per FM 100-2-1.)

Appendix H. Glossary of March Terms

1. column gap is space between two organized march elements (march units, serials, or convoys) following each other on the same route. It can be calculated in units of length (road gap) or in units of time (time gap) as measured from the rear of one element to the front of the following element.

2. march column (or convoy) includes all elements using the same route for a single movement under control of a single commander (for example, a brigade). A large column may be composed of several subdivisions (serials) each under the control of a subordinate commander.

3. march unit is a subdivision of a serial and is normally a squad, section, platoon, or company. It moves and halts under control of a single commander (i.e., the march unit is the smallest march formation).

4. pass time (PST) of a column, serial, or march unit is the actual time between the moment the first vehicle passes a given point and the moment the last vehicle passes the same point. (For the purposes of this study, pass time is also equal to closure time, which refers to the amount of time a column requires to close all vehicles into a given location or assembly area. This represents an ideal closure--usually some extra time above the actual pass time is needed to physically close all vehicles into an assembly area. The amount of extra time depends upon the march discipline and training of the unit as well as the nature of the assembly area. If all goes smoothly, closure time should come very close to pass time, as is reflected in this monograph.)

5. rate of march is the average number of miles or kilometers traveled in any given period of time, including short periodic halts and other short delays. It is expressed in kilometers in the hour (Kmih) or miles in the hour (Mih).

6. road space is the length of roadway occupied by a march column (convoy) or a subgroup thereof (serial or march unit) and any space (road gap) added to the length that may be required for safety or to maintain flexibility. In other words, it is the sum of the lengths of the vehicles, the intervals between the vehicles, and the gaps between the march columns and the subgroups.

7. serial is a major subdivision of a march column (convoy), organized as a single unit under one commander for purposes of planning, regulation, and control. A battalion task force usually forms a serial.

8. vehicle density (or traffic density) is the average number of vehicles that occupy 1 mile or 1 kilometer of road space, expressed in vehicles per mile (VPM) or vehicles per kilometer (VPK).

9. vehicle interval (or vehicle distance) is the space between two consecutive vehicles of an organized element of a column. It is usually expressed in meters.

NOTE: Definitions are taken from Appendix H (Road Marches and Assembly Areas) to FM 71-2, The Tank and Mechanized Infantry Battalion Task Force, 30 June 1977, and from Chapter 8 (Highway Regulation) to FM 55-10, Army Movement Management Units and Procedures, January 1977.

Endnotes

1. Field Manual 100-5, Operations (Fort Leavenworth, KS: October 1985, p. 2-8 (Final Draft).

2. David G. Chandler, The Campaigns of Napoleon (New York, NY: 1966), p. 151.

3. Chandler, p. 371. While a Napoleonic corps moved in a concentrated manner compared to a modern, mechanized formation, the corps columns, nevertheless, were of a sizable length. A typical Napoleonic corps might have three infantry divisions, two cavalry regiments, and 10 batteries of horse and field artillery (as did Davout's III Corps at Eylau in 1807). According to Chandler (pp. 371-372), an infantry division occupied 4 kilometers of road space while on the march, and a cavalry regiment occupied 1,000 yards (.9 kilometers). Given some space between divisions and regiments, and allotting another 2 kilometers for the artillery, Davout's column was 16-18 kilometers long. The pass time for this column, given a 3 MPH (4.83 KMPH) rate of march as cited by Chandler, would be from 3 1/2 to 4 hours.

4. LTC L. D. Holder, "A New Day for Operational Art," Army (March 1985), p. 28.

5. Hugh M. Cole, The Ardennes: Battle of the Bulge (Washington, DC: 1965), p. 486. See also GEN George S. Patton, Jr., War As I Knew It (New York, NY: 1981, original copyright 1947), pp. 179-180.

6. Cole, pp. 485-486.

7. GEN George S. Patton, Jr., War As I Knew It (New York, NY: 1981, original copyright 1947), p. 180.

8. Third Army Afteraction Report, 1 August 1944 - 9 May 1945, Volume II, "Staff Section Report," Provost Marshal Section, p. 16 and Provost Marshal Section Annexes, p. ix. The lengths of these routes as used for determining march distances for both the actual III Corps move and the fictional move by the notional AOE XX Corps portrayed in Section 3 were determined by examining the 1943-1944 U.S. War Office Geological Section Maps (1:100,000 scale). The following sheets were used: Series #4336 (1943), Sheets 13 (Marche), 17 (Arlon), and 21 (Verdun); Series #4416 (1944), Sheets V.1 (Saarbruecken), T.1 (Trier), and U.1 (Neunkirchen).

9. Cole, p. 486.

10. Ibid., p. 487.

11. Third Army Afteraction Report, Volume II, G4 Section, p. 37.

12. Cole, pp. 486-487.

13. Third Corps Afteraction Report, December 1944, p. 6.

14. Third Army Afteraction Report, 1 August 1944 - 9 May 1945, Volume I, "From the Channel to the Alps," p. 168.

15. Headquarters Fourth Armored Division Afteraction Report, December 1944, Part I, "Division and Combat Command Afteraction Reports," Fourth Armored Division Operating Instructions, dated 19 December 1944.

16. Headquarters Fourth Armored Division Afteraction Report, Part 1, Combat Command A Afteraction Report.

17. Cole, p. 511.

18. Patton, p. 181. See also Russell F. Weigley, Eisenhower's Lieutenants (Bloomington, IN: 1981), pp. 499-500.

19. Third Corps Afteraction Report, p. 9.

20. Third Army Afteraction Report, Volume II, Artillery Section, p. 15. See also Third Corps Afteraction Report, p. 9.

21. MAJ Gregory V. Morton, "Field Artillery Support for III Corps Attack, 18-26 December 1944," MMAS Thesis (Fort Leavenworth, KS: 1985), pp. 40-41. This thesis provides a thorough discussion of how the III Corps moved, organized, and used its artillery during the III Corps counterattack commencing 22 December 1944.

22. Third Army Afteraction Report, Volume I, p. 169.

23. Cole, p. 512.

24. Third Army Afteraction Report, Volume II, G4 Section, p. 41.

25. Ibid., p. 40.

26. Third Army Afteraction Report, Volume I, Annex 2, "Third Army Directives," p. xix.

27. See Third Corps Afteraction Report for a copy of this order.

28. Headquarters Fourth Armored Division Afteraction Report, Part 1, 4th Armored Division Operating Instructions, dated 19 December 1944.

29. Third Army Afteraction Report, Volume II, Provost Marshal Section, Annexes, p. i.

30. Russell F. Weigley, Eisenhower's Lieutenants (Bloomington, IN: 1981), p. 500.

31. Third Army Afteraction Report, Volume I, p. 169.

32. Ibid., Volume II, Provost Marshal Section, Annexes, p. i.

33. Holder, p. 27.

34. V. YE Savkin, The Basic Principles of Operational Art and Tactics (Washington, DC: 1972), p. 174.

35. Ibid.

36. Richard Simpkin, Red Armor (England: 1984), p. 89. In this book Simpkin examines Soviet tactical and operational movement in detail and actually calculates how fast the Soviets should be able to move and how well they will be able to attain their stated daily rates of advance. I highly recommend this book to anyone interested in learning about large-unit, mobile operations.

37. Simpkin, p. 84. My brief examination of Soviet march procedures supports Simpkin's position that the Soviet procedures are essentially the same as those in Western armies. See Oleg Hoeffding, "Troop Movements in Soviet Tactical Doctrine: An Annotated Translation," Rand Report R-878-PR (November 1971) and "March Possibilities. What Are They? How Is the Timing of the March Made?" Soviet Military Review (March 1984), pp. 42-43. An excellent summary of Soviet march procedures is presented in FM 100-2-1, The Soviet Army: Operations and Tactics (Washington, DC: 1984), Chapter 5. The data and procedures described in this FM were used in formulating the Soviet march data in Appendix G of this monograph.

38. Patton, pp. 338-339.

39. Leo Heiman, "Soviet Invasion Weaknesses," Military Review (August 1969), p. 41.

40. This data is contained in U.S. Army Technical Manual 5-822-2, Table II-1, an extract of which can be found in U.S. Army Engineer School Pamphlet, Design Data, Soils Engineering, Design of Flexible Pavement Structures (Fort Belvoir, VA: September 1975), p. 14.

41. This figure for bulk fuel hauling capability was determined from the AOE heavy division TO&E 87-00J43 (1 April 1984), which provided the following information:

	Number Available	Carrying Capacity
Drum, Fabric, Collapsible 500 gal (w/ tiedown kit):	26	(13,000 gal)
Truck, Tank, Fuel Servicing 2,500 gal 8X8:	36	(90,000 gal)
Truck, Tank, Fuel Servicing 2,500 gal:	64	(160,000 gal)
Semitrailer, Tank, 5,000 gal fuel dispensing:	64	(320,000 gal)
Tank and Pump Unit, Truckmounting (1,200 gal):	120	(144,000 gal)
Tank Unit Liquid Dispensing, Trailer-mounting (600 gal):	133	(79,800 gal)
Truck, Tank, Fuel Servicing 2 1/2 Ton (1,200 gal):	1	(1,200 gal)
	Total Fuel Haul:	808,000 gal

The AOE division also has some static storage capability, but this was not included in this example because these collapsible tanks can only be transported when empty:

Drum, Fabric, Collapsible 500 gal (w/o tiedown kit):	32	(16,000 gal)
Tank Assembly, Fabric, Collapsible, 10,000 gal, petrol:	12	(120,000 gal)
	Total Static Storage:	136,000 gal

42. This estimate for daily fuel usage for an AOE heavy division in combat was provided by CGSC Department of Sustainment and Resourcing Operations (DSRO) and is based on fuel consumption rates and estimation procedures found in USCGSC Student Text 101-2 (Fort Leavenworth, KS: June 1985), Chapter 2, Section III. It includes MOGAS, diesel, and JP4.

43. This haul capability figure was derived as follows:

Step 1: The mobility capability of each company-sized unit in the AOE division was extracted from the mobility paragraph of the organization's TO&E. (The TO&Es used are as listed in Appendix B--in a few cases, the mobility figures were not provided, so an estimate of the unit's capability was made based on a similar company-sized unit whose capability was given.) A total of these capabilities yielded:

23,500,000 lbs of transport capability

Step 2: Subtracted from the above figure was the total amount of TO&E equipment in each company-sized unit requiring transportation. This information was extracted from the mobility paragraph of the TO&Es in a fashion similar to that explained in step 1:

23,500,000 lbs capability
-10,500,000 lbs of TO&E equipment requiring transportation

13,000,000 lbs capability remaining

Step 3: Fifty pounds of individual clothing and equipment per man in the division was then subtracted from the remaining capability:

13,000,000 lbs capability
- 850,000 lbs clothing/equipment (50 lbs X 17,000 Personnel)

12,150,000 lbs capability remaining

Step 4: Weight of the fuel to be transported was then subtracted from the remaining capability. The 808,000 gals of fuel haul capability in the division (see endnote 41) was multiplied by a weight factor of 6.5 lbs per gal (which is an average weight factor derived from the weight of MOGAS, 6.11; diesel, 6.99; and JP-4, 6.42--reference is USCGSC Student Text 101-2, June 1985, table 2-7, p. 2-18), which equals 5,252,000 lbs:

12,150,000 lbs capability
- 5,252,000 lbs of fuel

6,898,000 lbs capability remaining

Step 5: This figure was then divided by 2,000 lbs to provide the short ton (ST) transport capability remaining to the AOE division:

6,898,000 lbs ÷ 2,000 lbs = 3,449 ST

44. The class I, V, and IX consumption rates were derived from USCGSC Student Text 101-2, June 1985:

Class I: One case of meal, ready to eat (MRE) has 12 meals and weighs 17 lbs (Table 2-4, p. 2-12). Each case feeds four personnel for a day, and the AOE division has approximately 17,000 people (17,000 ÷ 4 = 4,250 cases of MRE X 17 lbs = 72,250 lbs or 36 ST).

Class V: Consumption rate on the first day of a deliberate attack of an enemy position is 2,008.5 ST for an AOE mechanized division and 2,149.9 ST for an AOE armored division (an in-between figure of 2,050 ST was used.) Data from pp. 2-139 to 2-141.

Class IX: At a heavy level of commitment, an AOE mechanized division consumes 80.96 ST of class IX and an AOE armored division consumes 83.63 ST (pp. 2-195 to 2-196). (An in-between figure of 81 ST was cited).

45. See Simpkin, pp. 120-122, for a more detailed discussion of this procedure.

46. For a more detailed discussion of these staff agencies and their responsibilities, see FM 55-1, Army Transportation Services in a Theater of Operations (Washington, DC: 1984), Chapter 4; FM 55-2, Division Transportation Operations (Washington, DC: 1985), Chapters 3-5; and FM 63-3J, Combat Service Support Operations--Corps (12 August 1985), Chapter 7.

47. MG Albin G. Wheeler, "Operational Logistics in Support of the Deep Attack," Military Review (February 1986), pp. 15-16.

48. Field Marshal Albert Kesselring and others, "Night Combat," Historical Division European Command Project #40 (April 1959), pp. 15-16. See also DA Pamphlet 20-242, German Armored Traffic Control During the Russian Campaign (Washington, DC: 1952), Chapter 3.

49. Holder, p. 28.

50. Command and General Staff School Schedule, First Year Course, 1930-31.

51. Command and General Staff School Schedule, Second Year Course, 1930-31.

52. Holder, p. 32.

Bibliography

BOOKS

Chandler, David G., The Campaigns of Napoleon. New York, NY: MacMillan Publishing Co., 1966.

Cole, Hugh M. The Ardennes: Battle of the Bulge. Washington, DC: Office of the Chief of Military History, Department of the Army, 1965.

Patton, George S., Jr. War As I Knew It. New York, NY: Bantam Books, 1982 (original copyright 1947).

Savkin, V. YE. The Basic Principles of Operational Art and Tactics. Washington, DC: US Government Printing Office, 1972. (Translated from the Russian by the US Air Force.)

Simpkin, Richard. Red Armour. An Examination of the Soviet Mobile Force Concept. Oxford, England: Pergamon Press Ltd., 1984.

Weigley, Russell F. Eisenhower's Lieutenants. Bloomington, IN: Indiana University Press, 1981.

Willoughby, LTC Charles A. Maneuver in War. Harrisburg, PA: The Military Service Publishing Company, 1939.

MANUALS

Department of the Army Pamphlet 20-242, German Armored Traffic Control During the Russian Campaign. Washington, DC: US Government Printing Office, 1952.

Field Manual 19-1, Military Police Support for the AirLand Battle. Washington, DC: HQ Department of the Army, 1983.

Field Manual 55-1, Army Transportation Services in a Theater of Operations. Washington, DC: HQ Department of the Army, 1984.

Field Manual 55-2, Division Transportation Operations. Washington, DC: HQ Department of the Army, 1985.

Field Manual 55-10, Army Movement Management Units and Procedures. Washington, DC: HQ Department of the Army, 1977.

Field Manual 63-3J, Combat Service Support Operations--Corps. Washington, DC: HQ Department of the Army, 1985.

Field Manual 71-2, The Tank and Mechanized Infantry Battalion Task Force. Washington, DC: HQ Department of the Army, 1977.

Field Manual 100-2-1, The Soviet Army: Operations and Tactics. Washington, DC: HQ Department of the Army, 1984.

Field Manual 100-2-3, The Soviet Army: Troops, Organization and Equipment. Washington, DC: HQ Department of the Army, 1984.

Field Manual 100-5, Field Service Regulations: Operations. Washington, DC: US Government Printing Office, 1944.

Field Manual 100-5, Operations. Fort Leavenworth, KS: US Army Command and General Staff College, 28 October 1985 (Final Draft).

Field Manual 100-15, Corps Operations. Fort Leavenworth, KS: US Army Command and General Staff College, 1985 (Final Draft).

Field Manual 101-10, Staff Officers' Field Manual: Organizational, Technical and Logistical Data. Washington, DC: US Government Printing Office, 1944.

United States Army Engineer School Pamphlet E.002-AO-SI-006, Design Data, Soils Engineering, Design of Flexible Pavement Structures. Fort Belvoir, VA: September 1975.

United States Army Command and General Staff College Student Text 101-1, Organization and Tactical Reference Data for the Army in the Field. Fort Leavenworth, KS: June 1985.

United States Army Command and General Staff College Student Text 101-2, Planning Factors. Fort Leavenworth, KS: June 1985.

ARTICLES AND PERIODICALS

Cate, MAJ Paul E. "Large-Unit Operational Doctrine." Military Review. December 1978, pp. 40-47.

Crittenberger, LTG Willis D. and others. "Sum and Substance. Mobility in the Field Army." Armor. September-October 1951, pp. 18-25.

De Vries, LTC Paul T. "Maneuver and the Operational Level of War." Military Review. February 1983, pp. 13-34.

Heiman, Leo. "Soviet Invasion Weaknesses." Military Review. August 1969, pp. 38-45.

Holder, LTC L. D. "A New Day for Operational Art." Army. March 1985, pp. 22-32.

Hutson, COL Richard K. "Movement Is Not Just Logistics." Military Review. January 1965, pp. 52-53.

"March Possibilities. What Are They? How Is the Timing of the March Made?" Soviet Military Review. March 1984, pp. 42-43.

O'Meara, COL Andrew P., Jr. "Dimensions of Mobility." Armor. January-February 1982, pp. 22-25.

Wheeler, MG Albin G. "Operational Logistics in Support of the Deep Attack." Military Review. February 1985, pp. 13-19.

DOCUMENTS

Command and General Staff School Schedules, First Year Course 1930-31, Second Year Course 1930-31, First Year Course 1932-33, Second Year Course 1932-33, First Year Course 1933-34, and Second Year Course 1934-35. CGSC reference file, CARL.

Department of the Army Tables of Organization and Equipment, J4/J5 Series (Army of Excellence) and H-Series.

Hall, LTC D. N. "Organization and Operation of Traffic Headquarters in the Division and Larger Units." CGSC Analytical Study #4-9, 1947-48. CARL Ref #2128.106.

Headquarters European Theater of Operation SOP #50, "Road Traffic Regulation and Control on the Continent." 7 October 1944. CARL ref #8076.1.

Headquarters Eightieth Infantry Division After Action Report, August 1944 - May 1945. CARL ref #11592.

Headquarters Fourth Armored Division After Action Report, December 1944, Part 1 (Division and Combat Command A/A Reports) and Part 3 (Division G3 Journal). CARL ref #12562.1 and 12562.3A.

Hoeffding, Oleg. "Troop Movements in Soviet Tactical Doctrine: An Annotated Translation." November 1971, Rand Report R-878-PR. CARL ref #AD738289.

Kesselring, Field Marshal Albert and others. "Night Combat," Historical Division European Command Project #40, April 1959. CARL ref #17500.17A.

Morton, MAJ Gregory V. "Field Artillery Support for III Corps Attack, 18-26 December 1944," MMAS Thesis, Fort Leavenworth, KS, 1985.

Patton, LTG George S., Jr. "Notes on Bastogne Operation," 16 January 1945. CARL ref #11548.

Third Army Administrative Instructions #2, 19 November 1944.

Third Army After Action Report, 1 August 1944 - 9 May 1945, Volume I ("From the Channel to the Alps"), and Volume II ("Staff Section Reports"). CARL ref #11480-A-7 and 11480-B-7.

Third Corps After Action Report, December 1944. CARL ref #12029.

Maps, Geographical Section, General Staff, War Office, Central Europe, 1:100,000, Series #4336 (1943): Sheets 13 (Marche), 17 (Arlon), 21 (Verdun); Series #4416 (1944): Sheets V.1 (Saarbruecken), T.1 (Trier), and U.1 (Neunkirchen).

END

12-86

DTIC